FOOD MANUFACTURE

Incorporating Food Industries Manual

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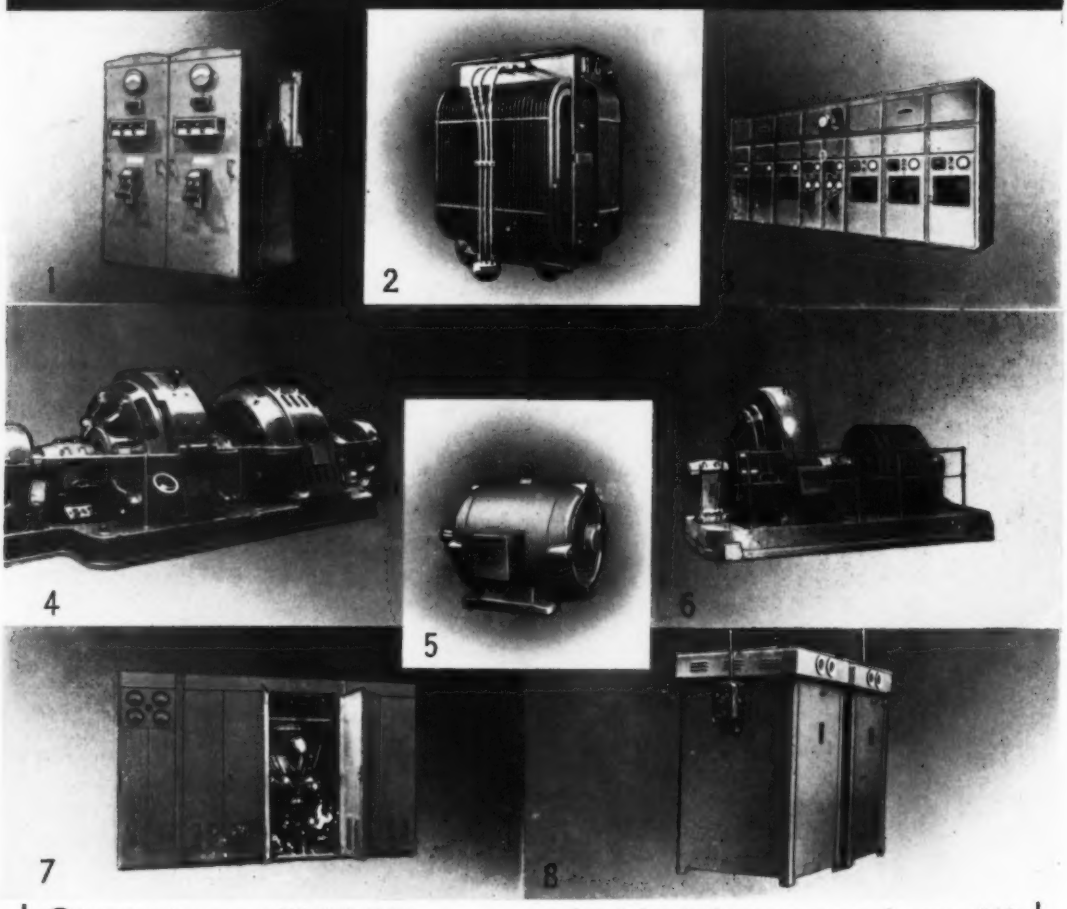

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FOOD MANUFACTURE

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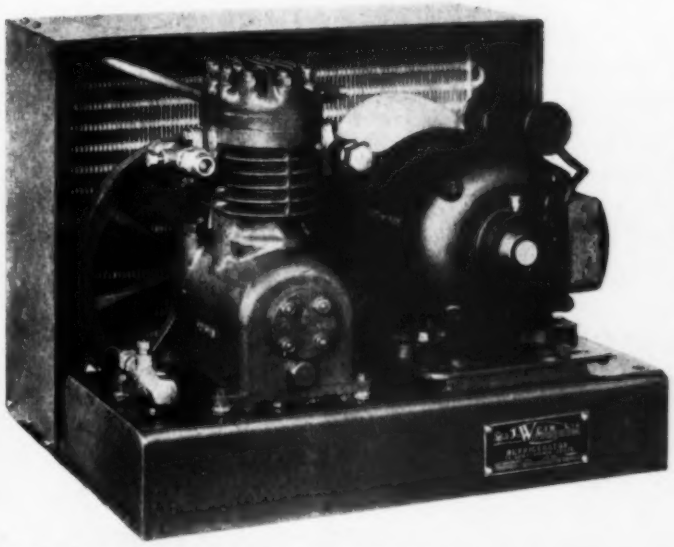

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FOOD MANUFACTURE

Vol. XXVI, No. 2 February 1, 1951

Aluminium Package Shortage

A THREATENED aluminium ingot shortage in Britain is a source of some concern and speculation, not only in the aluminium industry itself, but also in those industries which for several years have come increasingly to depend upon a plentiful supply of the metal. The effect of the new shortage would be felt in the packaging field perhaps more than in any other.

When, some years ago, the first signs of a world shortage of lead and tin forced upon the packaging industry the need for finding substitute materials, aluminium was the natural choice. Not only was it in plentiful supply, but for many years its merits in packaging had been appreciated in spite of its higher cost.

Both manufacturers and users were finding that aluminium containers were attractive in appearance, pleasant to touch, and easy to open, while in food packaging, especially, their non-rusting and non-staining characteristics were recognised as being of major importance. The result was a much more extensive use of aluminium, which soon ceased to be regarded as a substitute, and became a desirable material in its own right.

By the end of 1949, over 1,000 tons of aluminium a month were being used for containers of food, pharmaceuticals, and the like. The chief suppliers, Northern Aluminium Company, were providing about half of that amount, as container sheet, foil stock, and slugs for impact extrusion; moreover, they were completing their new continuous strip mill at Rogerstone, and thereby greatly enlarging their capacity for the production of container sheet and foil stock by methods which could be expected to reduce prices.

A few months ago, with the scheduled expansion of the rearmament programme, the reduction of steel available for tinplate introduced further difficulties for the packaging industry, and it appeared that aluminium would be called upon to make good a yet greater deficiency in packaging materials.

Now, with the threatened shortage of aluminium itself, and no immediate prospect of an increase in supply of other materials, the situation appears particularly depressing, meriting immediate review by the Government.

Nitrite-Ice and Fish

As is well known, a truly satisfactory fish "freshness" cannot be indefinitely retained by stowage with ice. The farther north trawlers must travel for their catch, the more important becomes this problem of preservation. Ultimately, perhaps, the solution is to be found with large trawlers carrying quick-freezing plant and cold stores; but this will involve a large-scale re-equipment of fishing fleets, and it may be a case not of "first catch your fish" but of "first catch your capital." For years ahead a large proportion of our fish, especially white fish, will be caught far afield, and its state of freshness at the ports will depend upon the ice-stowage method.

Several recent Canadian papers have dealt with the joint use of ice and chemical preservatives, in particular with ice that actually contains small amounts of sodium nitrite. A communication from Dr. J. M. Shewan, of the Torry Research Station, published a few weeks ago (*Nature*, **166**, 4223), reveals that British war-time research in 1941 made some headway with nitrite-ice before the experiments had to be abandoned for more urgent tasks. Ice containing 0·1 per cent. of sodium nitrite prolonged the period of freshness by three to four days; and 0·15 per cent. prolonged it by seven to eight days. The presence of the nitrite appeared to suppress the bacterial production of trimethylamine.

During ice stowage and when loss of ice by melting had to be periodically made good by the addition of more 0·1 per cent. nitrite-containing ice, the nitrite content of the fish itself rose to a maximum of 400 parts per million by the tenth day, after which this concentration began to fall until it reached zero about the twenty-third day. Bacterial reduction of the nitrite to nitrogen was believed to be responsible for this gradual fall. With the 0·15 per cent. nitrite-ice the nitrite peak in the fish reached 500 parts per million, and the same gradual fall took place, but here some nitrite content could still be measured after twenty-three days.

It seems a great pity that these British investigations were not renewed after the war. If sodium nitrite can lengthen the period of ice stowage and if the nitrite assimilated in the fish flesh is gradually dissipated, there seems every hope of a successful technique being established. The addition of a few

hundred extra parts per million of a sodium salt would seem the only significant residual effect of this preservative, an effect that should worry nobody so far as fish are concerned. It also seems a pity that this British research of 1941 has remained unpublished until 1950, and that even now it has to be said that a full report "will be published elsewhere." We seem to remember a number of pleas made in the earlier post-war years for the fuller publication of the results of war-time research.

The Ration Nobody Bothers About

At the end of 1949 margarine was rationed in seven countries—Ireland, Denmark, Norway, Germany, Austria, Finland, and Britain. At the end of 1950 the seven had become two—Finland and Britain—and in Finland butter is unrationed so that the rationing of margarine there is not a restriction upon fat consumption. Here in Britain, the only country in the world where both butter and margarine are rationed, the percentage of the margarine ration not taken up rose from 10 per cent. to 12 per cent. during 1950. In presenting these facts recently *The Financial Times* posed the question, "Why Ration Margarine?" If five soft currency countries could dispose of this particular control during 1950, why was Britain unable to do so?

One fact is increasingly evident. The continued rationing of margarine is not preventing the housewife from satisfying her requirements for this commodity. There is no "grey market," although so many personal rations are left unbought. When the Board of Trade's clothing coupon system was kept in operation in similar circumstances, there was indeed a "grey-to-black" market, and most people needing more clothes than the permitted ration could secure coupons from those who made do with less. It is clear that the domestic demand for margarine is rather smaller than the total quantity made available on the ration.

The conclusion reached by *The Financial Times* was that the personal rationing system was being maintained so that manufacturers using margarine on allocation (the fixed proportion of their 1939 usage) could not obtain additional supplies by making purchases across shop counters. The margarine on the domestic ration is subsidised and that sold on allocation to bakers, etc., is not.

If this suggestion is anywhere near the truth, it shows once again that the subsidies that flourish in a Welfare State's distribution system inevitably stimulate and perpetuate rationing. Another possible reason for the continuation of margarine rationing is that it is psychologically useful for the Ministry of Food to have an easily dispensable ration up its sleeve; for if some other ration must be tightened up, the chance is always there for margarine to be derationed with a blast of trumpets.

If this is the real reason, we feel that Mr. Webb has left it too long. Shoppers know only too well that margarine rationing is a farce and their only reaction to margarine freedom will be a sharp rejoinder: "About time too!" Certainly nobody waved flags when the ration was raised towards the end of 1950.

By the time these words appear in print margarine may have been promoted to domestic freedom along with milk and eggs in spring and summer. It will not increase the demand for margarine whenever this takes place, as it surely must, in 1951.

A Notable Retirement

It is given to few scientists to achieve a continuity of subject and venue for their life work. In this respect Professor B. T. P. Barker of Long Ashton can look back upon a career that must be unique in twentieth century scientific research. For forty-seven years he has been continuously associated with the Long Ashton Research Station.

In 1943 he retired from the position of Director, a position he had held from the inception of the station in 1903; but this in no way severed his intimate connexion with Long Ashton. Freed from the responsibilities of leadership and administration, he returned with a youthful enthusiasm to his old and original love, the investigation of problems in cider making. For almost another seven years he continued as a part-time research worker to serve the institution that he, more than any other man, had built up.

In 1903 a farm cottage, a farm shed, a tiny lean-to building for a laboratory, and eight acres for experimental orcharding, were all that comprised the National Fruit and Cider Institute. A scientific staff of one was appointed—B. T. P. Barker, M.A., Cambridge graduate. Until 1912 this privately funded research unit functioned independently; then it entered into association with the University of Bristol to develop into an Agricultural Research Institute administered by the Board of Agriculture. Investigations into fruit cultivation problems and the control of fruit pests and diseases were added to the original assignment of cider research. New buildings were erected, and the initial eight acres became more than two hundred and fifty.

The first world war held back developments, but after 1918 the young research station expanded rapidly. Professor Barker was continuously responsible for all this widening activity. The Campden Research Station, so well known today to the canning industry, came into separate existence as an offshoot of Long Ashton. A strong advisory service was built up, eventually with its own premises in Bristol; it has become today the N.A.A.S. headquarters for the south-west. When in 1943 Professor Barker relinquished his duties as Director, the

staff and assistant staff at Long Ashton alone numbered 56, and this was a war-curtailed figure. In his further years there he has been able to see yet another vigorous period of post-war expansion.

Although Professor Barker's official connexion with Long Ashton has now come to an end, we are glad to learn that he will often be found there in the future, still pursuing clues to cider problems, but now as an entirely private worker.

East African Groundnut Scheme No. 2

The recently published White Paper "The Future of the Overseas Food Corporation" (Cmd. 8125) may be viewed as an epitaph on the original East African groundnuts scheme. It was evident three years or more ago that "someone had blundered," but at this juncture tears are useless, even for the tidy sum of £36½ million that has had to be written off. This sum was £13½ million more than the original estimate, a margin of error which has required a good deal of explaining away.

Estimates for the new scheme set out in the White Paper amount to about £6 million, and the warning is sounded that "during the initial period trading deficits are bound to occur." Perhaps there may be a certain amount of comfort to be derived from the Government's statement that the proposed expenditure would not be more than it would have cost had the original scheme with its surviving assets on the spot been abandoned altogether.

We can only hope that this costly example of the folly of undue haste and unwarranted optimism will result in saner counsels and more efficient management of the new project.

Antibiotics and Growth

Until quite recently the functions of such modern antibiotic substances as penicillin and streptomycin have largely been confined to the conquest of disease. A new and dramatic chapter in their history is now unfolding. When added to food they increase its nutritive properties. Quite small amounts of antibiotic substances in animal feedingstuffs lead to marked increases in growth and weight.

Tests with chickens, turkeys, cats, rats, and pigs have shown that 10 to 30 per cent. gains in weight above the expectative performances on food supplied have followed the addition of antibiotic substances.

Three speculative explanations have been put forward as to why this should be so. Firstly, the growth of micro-organisms that retard animal development is suppressed by antibiotics; secondly, by suppressing certain organisms, the antibiotics encourage the growth of other and more favourable organisms; and thirdly, by suppressing bacterial growth, more vitamins and amino acids in the food are made available to the animal.

Particularly effective is terramycin, the new antibiotic obtained from soil moulds. Groups of pigs were fed on similar basic rations, but for four groups a little less than one-third of an ounce of antibiotic substance was mixed into each ton of feed. Four different antibiotics were tested, terramycin, streptomycin, aureomycin, and penicillin. In the same order, the percentage gains in pig weight over the control group were 18, 15, 11, and 7 respectively.

The fact that the most effective antibiotic is derived from soil fungi seems more than a coincidence; indeed, in some pig-feeding experiments the addition of a low percentage of ordinary farm "dirt" to the feed led to improvements in growth and health!

One conclusion may certainly be drawn—a number of growth-promoting substances in foods and soils have still to be identified.

It is too early to attempt to forecast the practical consequences of these new discoveries of antibiotic effects. There are indications that similar growth-promoting effects are obtained when antibiotics are added as traces to human foods. Fortification of some foods with vitamins is already a well-known practice. The eventual possibilities of fortification with antibiotics would appear to be far-reaching.

Electricity and Productivity

The relationship between the much greater use made of electricity in American industry and the fact that the increase in productivity per man hour in America had been about twice that in Great Britain were pointed out by Mr. H. Dreghorn, of the British Thomson-Houston Co., when he spoke on "Motive Power in the Factory" at the two-day conference on "Electricity as an Aid to Productivity" organised by the Institution of Electrical Engineers.

During the last ten years, the consumption of electricity in British industry had increased approximately 90 per cent., and had now reached a figure of about 20,000 million units per year; the increase in American industry during the same period had been 160 per cent.

Commenting on the keenness of the American operator to use labour-saving devices, Mr. Dreghorn said: "Their creed is the harnessing of more and more power to aid and accelerate production processes, and the sooner we also become disciples of this faith, the sooner will increased productivity be achieved in this country."

It was further claimed that mechanisation and electrification had been a contributory cause of the decrease in the accidents in industry rate in Great Britain, while Mr. G. V. Sadler, who spoke on "Materials Handling," gave examples of the financial saving brought about by electrical handling of goods.

An analysis of the handling costs of materials recently made in some industrial concerns had re-

vealed that some 35 to 40 per cent. of the cost of the finished product was spent that way. Manhandling of goods and materials, he said, had become uneconomic; not only was it humane to put a stop to the heaving, tugging, and pushing of many heavy loads, but the use of electrically driven machines also released men for more productive work.

Colour and Taste of Tomato Purée

In view of the problems connected with the conservation of the colour and taste of tomato purée after the necessary processing of material such as fish in packs in which it forms a constituent, the report of the Director of the Fishing Industry Research Institute of South Africa is of interest.

He states that the remarkable effect of small quantities of insoluble tomato solids in thickening tomato purée has been confirmed. It was found that purées containing 1 per cent. total soluble solids were watery when the insoluble solids were low, yet purées with the same total soluble solids were thick when the insoluble solids were raised to 2·4 per cent. A ratio of total to insoluble solids of not more than 8 seems satisfactory. These conclusions were reached both by examination of commercially produced purées and by producing different purées in the laboratory from the same stock of pulp.

The increase in the insoluble solids has the further advantage of intensifying the red colour of the purée. Thickening agents such as flour, corn starch, potato starch, and agar gave the purée a slimy texture and the product lacked tomato flavour. Further laboratory tests and commercial trials on the addition of 0·5 per cent. of oil to pulp before concentrating confirmed the improvement in colour of the final tomato sauce in canned fish in most cases, except where they equalled the colour of the sauces into which oil had been homogenised. Attempts to avoid discoloration of the purée during canning with fish by means of thin protective films of agar and acid agar around the fish were unsuccessful.

Canneries to Close

The Blairgowrie and Coupar Angus fruit and vegetable canning factories and three others south of the border have been closed owing to the shortage of tinplate. Smedley's is the firm concerned, but we gather that the majority of canning firms in Scotland are in similar difficulties. The industry's representatives are pressing, through the National Farmers' Unions of Scotland and England, for urgent consideration of the position by the Government.

It is true that closing down at this time or later is a fairly normal seasonal feature of some canning firms, but in this case the firm had orders which would have kept the factories going until the spring.

This situation, which affects a large number of local employees, has caused deep concern in the vegetable- and fruit-growing industry, in which great strides have recently been made in production to meet the needs of the canning firms.

It is understood that in spite of this serious shortage of tinplate and its disastrous effect on Britain's fruit and vegetable industry, tinplate is being exported, but protests to the Government have failed to secure any promise of immediate relief.

It is stated that orders were available for canned beetroot which would have taken up 100 or even 200 tons from the Lothians. These orders have had to be refused, and now the beet is being disposed of at less than the cost of production, and it is possible that much will be wasted. "It is a blue lookout for the soft fruit industry," declares one leading grower, who added that it was hoped that it would be possible to get an improvement in tinplate supplies in the near future. One cause of the shortage is that the firms are saving some tinplate for the summer packing of peas and fruit which must be dealt with immediately they become available.

A Canterbury Tale

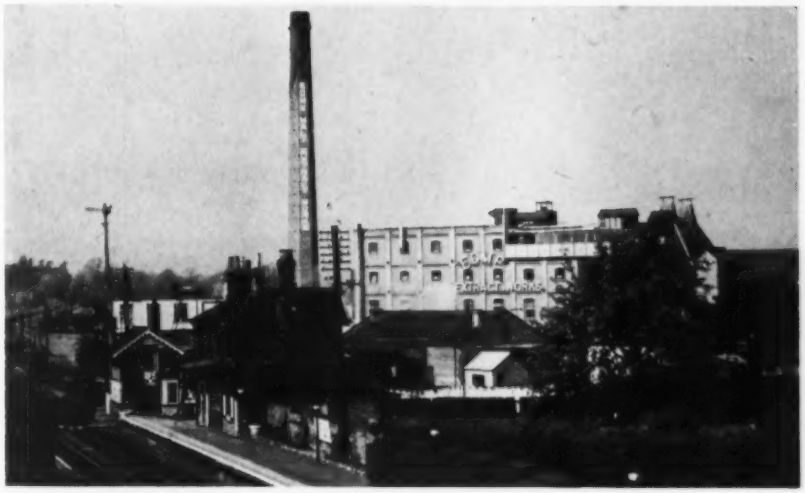
The centenary of the founding of the province of Canterbury, New Zealand, by that first group of English settlers brings to mind how the birth of refrigeration in 1880 had such a striking effect on the economical well-being of the settlement. The story of that first party of 800 emigrants, including clergymen, teachers, artisans, and labourers; of the 100 days' voyage; of how Wakefield conceived the idea of such a colony while he was in Newdigate Prison—all this is part of the island's history.

Lamb and mutton continue this Canterbury tale. The first sheep coming from New South Wales were merinos. Since there was no method of exporting mutton to other countries until the late 1870's, only wool, tallow, and a little canned mutton were exported. The colony had a large meat consumption—but not high enough. Large numbers of old sheep were boiled down for tallow, while the rest of the carcass was wasted.

That first commercial shipment of frozen mutton in February, 1882, altered things. The entire industry of sheep-raising was changed, mutton breeds of sheep being the new emphasis, with large flocks of crossbreds suitable for both mutton and wool being built up. Merinos were still in evidence, but breeds like Corriedales became far more popular around Canterbury. Flocks increased to a maximum of 26½ million sheep in 1918, the peak being due to shortage of shipping caused by the war. The Canterbury tale is thus seen to be incomplete without that later critical chapter written after the birth of refrigeration.

The Manufacture of Malt Extract

The history of Edme Limited dates back to the earliest days of the manufacture of malt extract. Established in 1881 and incorporated as a limited liability company ten years later, the firm was a pioneer in this field of industry.



THE first managing director of Edme's was Mr. Stanley Free, whose uncle, Mr. Robert Free, was associated with the establishment of the organisation. Mr. Henry A. Dowding subsequently became chairman and managing director, and later Mr. Fred J. Bearman, the present chairman and managing director, was appointed. Mr. Bearman is well known, not only in the brewery world, but also in the world of sport, being chairman of Tottenham Hotspur Football Club.

The other members of the board of directors of the company are: Mr. R. T. Newman, Mr. Harold Heron, F.C.S., the well-known brewery consultant, Mr. W. W. Dowding, Mr. F. John Bearman, A.M.I.Mech.E., resident director of the Edme Works at Mistley, Essex, and the maltings at Manningtree and Sudbury, and Mr. W. R. Pountney, F.I.A.C., director and secretary in charge of the London headquarters.

Progressive Methods

The progressive character of the firm is shown by the steps constantly taken to keep abreast of the times. Big structural and equipment alterations have been made; since 1919, entirely new plant, including specially designed evaporators, vacuum pumps, mash tuns, automatic malt extract driers, and ancillary equipment, has been installed. A new electrical substation has been erected, and a four-storey packing and filling station has been built.

The firm produces high diastatic extracts for the brewery trade, malt extracts for bakers and chemists, food beverages, malt flour for breadmaking, and malt extract powders in dry form.

Selecting the Barley

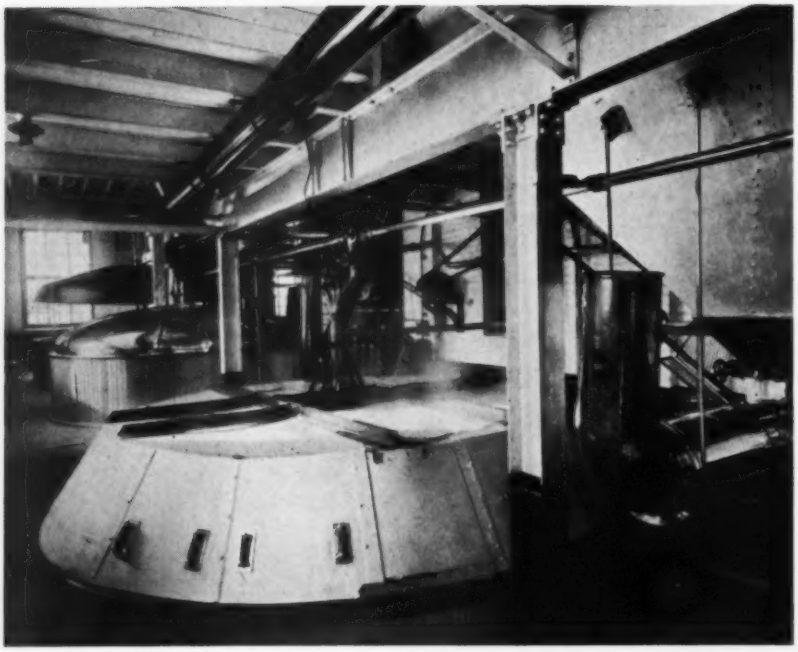
Prior to manufacturing operations, barley has to be sought, tested, stored, and malted. This is an industry in itself and forms an extensive department of the organisation, which has its own modern maltings at Manningtree and Sudbury.

Much depends upon the selection of the barley and its treatment during malting operations, which call for the highest skill. Every sample of barley is tested for quality and if suitable is purchased, after which further tests are applied. The barley is then kiln or drum dried and stored for the requisite period, this being determined from season to season. Subsequently, it is steeped and remains in the tank for some 50 to 60 hours as may be necessary.

The Drying Operation

It is then floored and remains for 8 to 10 days in order to obtain such modification as may be required. On completion of the flooring, the now fully malted barley is elevated to the malt drying kilns or drums, as the case

Top floor of maltings at Sudbury, showing overhead steep tanks.



Part of the mash tun room.

may be, and dried at a temperature in accordance with the quality of malt required. After 3 to 4 days on the kiln, the malt is dressed and delivered to the works for conversion into malt extract.

Forming the Grist

The first step in the manufacture of malt extract is that of crushing the malt to form the grist. Combined with the mill there is a cleaning machine to free it from dust and other extraneous material. The mill consists of a series of rollers adjusted at different clearances so that grains of varying size are crushed without being completely smashed. The grist is not crushed too small, since the clarification of the wort as it runs out of the mash tun depends largely on the condition of the residual malt, or grains, for the formation of a suitable filter bed.

Mashing and Evaporating

The grist is delivered to steel hoppers, from which begins the important operation of mashing. The grist is infused with hot water in copper Steel's mashing machines and the mixture or mash is delivered to the mash tuns. The tun is a cast-iron or copper vessel fitted with a perforated copper false bottom; it may be equipped with metal rakes to even out the mash if necessary. The sparge is placed near the top of the tun and is so fitted that, as the water is fed into it to wash the grains, it revolves slowly, ensuring an even distribution of sparging water over the whole surface of the mash. During mashing, very strict temperature control is maintained.

After a period of digestion, the wort from these vessels is drawn into specially constructed evaporators in which high vacuum is maintained in order that the diastase and enzymes are preserved.

The extract is evaporated until the total solids are about 77 to 80 per cent. The syrup is run into blending vessels to await analysis and, when this is completed, the finished malt extract is put into

A section of the vacuum evaporating room.

jars, tins, drums, or churns as may be required. The spent grains from the mash tuns are dried in steam and hot air drying machines for use as cattle food.

Malt extract and malt oil ready packed for despatch.

Water Supplies

The works have artesian wells 300 ft. in depth which supply water tanks 50 ft. above ground level; some forty to fifty thousand gallons of water per hour, 24 hours a day, are required to meet the needs of the factory. The boiler house, constructed in 1930, has a battery of six boilers, and the output is controlled for fuel economy reasons at 35,000 lb. of steam per hour, working at 125 lb. per sq. inch. A 100 kW. emergency power plant is available to assist during periods of load shedding, etc., and, in the winter, additional steam prime movers replace certain large electric motors further to assist in reducing the peak electricity load.

Strict chemical control is exercised by the staff of a well-equipped laboratory which plays an important part in maintaining the quality and consistency of the company's products.

Staff Welfare

The welfare of the staff is a foremost consideration of the firm. Every up-to-date appliance has been installed in the modern canteen, including central heating and wireless. Situated about 1½ miles from the factory is the firm's own housing estate where key employees live. They are conveyed to and from their work by the firm's lorries.

The battery of boilers in the boiler house.

SUPPLIERS OF EQUIPMENT

Mashing machines and mash tuns: *Geo. Adlam and Sons.*
Malting drying drums: *D. C. Robertson, A.M.I.C.E.*
Mechanical turners and steeping tanks: *H. J. H. King and Co.*
Malt cleaning machines: *Robt. Boby and Co.*
Malt dressing machines: *Nalder and Nalder; Robt. Boby and Co.*
Mills: *Geo. Porteous.*
Evaporators and vacuum pumps: *Pontifex; Mirrlees Watson and Co.*
Temperature recorders: *The Cambridge Instrument Co.*
Automatic malt extract driers: *Bennett Sons and Shears.*
Drums: *G. T. Johnson and Co.*
Churns: *The Dairy Supply Co.*
Jars: *The Canning Town Glass Works; Forsters Glass Co.*
Tins: *The Self Opening Tin Box Co.*
Boilers: *John Thompson and Co.; Davey Paxman and Co.*
Feed pumps: *G. and J. Weir.*
Fuel economiser: *E. Green.*
Automatic coal handling and stoking gear: *Bennis Combustion.*
Electric motors: *Electric Construction Co.*
Artesian wells: *C. Isler and Co.*
Auxiliary power plant: *Davey Paxman and Co.*
Structural steel work: *Cochsedge and Co.*
Lorry chassis: *Morris Motors.*
Lorry bodies: *P. G. Page.*
Electrical installation: *Central Electrical Co.*
Buildings: *Rose Bros; Wakelin-Rampling.*

Correspondence

To the Editor of
FOOD MANUFACTURE

Vanilla Research

DEAR SIR,—Your October issue, on page 398, contains an interesting statement regarding vanilla research.

This company has maintained a research plantation in Puerto Rico for fifteen years. We have lived through the problems of root disease and have seen our initial bright prospects dimmed considerably by its devastation.

Nevertheless, we were convinced that a long range attack must be made and that a solution of the problem was essential for the future of the vanilla flavouring industry. We felt that the solution, if it could be attained, would be reflected in a healthier vanilla culture in all other parts of the world.

The ice cream industry, in the States, consumes almost half of the vanilla imports. Ice cream, here, is considered to be in the nature of a basic foodstuff, because, by its attractive nature, it appeals to every age group and provides an easily assimilable source of nutrients. *Per capita* consumption of this food product has been increasing slowly but surely for decades.

In addition to its nutritional value, the ice cream products absorb a considerable volume of what would otherwise be surplus dairy products. For this reason, the industry has been called the "balance wheel of dairying" in the United States. Vanilla ice cream constitutes at least 50 per cent. of all production. Its appetite appeal, therefore, determines the success or failure of the industry.

It has been found that the product presents peculiar flavouring problems owing to its nature. Served at a low temperature, the aromatics are not easily conveyed to the sensory organs. The butterfat adsorbs considerable portions of the flavouring and interposes a hurdle that must be overcome. Synthetics alone do not provide the maximum subtlety of flavour and they tend to overshadow the most important ingredients of a good ice cream—the dairy products themselves. Long years of experience have proved that a combination of the agricultural product with synthetic vanillin imparts a characteristic which is most favoured by the consumers.

We have had more than half a century of highly specialised experience in the manufacture of vanilla flavouring for the ice cream industry, and have had more than an ordinary opportunity of observing the relative merits of the various types of materials used.

Convinced of the necessity for a continuing source of supply of vanilla beans, we entered into the difficult programme that has been undertaken in Puerto Rico. In addition, knowing of labour practices that had been common in all primitive tropical countries, we felt that the time would not be too far distant when considerably increased rates of pay would have to be given in order to raise the standards of living for these groups. Higher wages can result only from more efficient methods of production.

Our ten year co-operation research agreement with the local Federal Experiment Station has now been in effect for more than four years. We are jointly developing methods that may result in far higher yields per acre than were possible with older methods. Our wage scale has already risen from the 40 cents per day originally paid when we took over to $1.60 per day for common field labour and to $2.40 per day for those engaged in vanilla curing procedures.

The outcome of our research work is encouraging at the time of writing, and we are expanding our plantings for the first time since the devastating outbreak of the root rot disease.

The production of synthetics in the States has risen rapidly during the last decade, but there is still a bright outlook for modern methods in the production of a good agricultural product. It is our opinion that there is no threat to the future of our industry either in Puerto Rico or other areas.

In closing I wish to tell you how much we enjoy reading your very valuable publication, and we hope that we may be able to receive it for many years to come. Greetings for the New Year.

Cordially,
DAVID MICHAEL AND CO., INC.
Philadelphia.

France's Food Industries

THE first edition of the *Répertoire des Industries Alimentaires* having been exhausted, the *Confédération de l'Alimentation belge* has undertaken the revision of this index,* the contents of which have been carefully brought up to date, and considerably improved and augmented.

As in the 1949 edition, a list of groupings affiliated both to the *Confédération de l'Alimentation belge* and to the *Confédération Professionelle du Sucre et de ses Dérivés* is included. This list, which supplies information about the composition of the administrative councils of these various groupings, concludes with the names of all the affiliated firms.

Next follows a list of the principal leaders of the food industries, and an alphabetical list of products and their manufacturers; both of these have been entirely revised.

The usefulness of this index of food industries is further enhanced by the addition of a directory of suppliers to the food industries. Firms thus have at their disposal a valuable source of reference when choosing their suppliers of plant, raw materials, and various other requirements.

* *Répertoire des Industries Alimentaires.* Edited by the *Confédération de l'Alimentation belge,* Brussels. Pp. 431. Price Frs. 125 (bound copies Frs. 200). Postage Frs. 10 extra in either case.

The Measurement of Detergent Strength

J. G. DAVIS, D.Sc., Ph.D., F.R.I.C.

Part II

POLARISATION is best minimised by the use of alternating currents of a frequency of about 1,000 c/s, but mains frequency (50 c/s) is commonly used in industrial instruments. Polarisation may be still further reduced by "platinising" the platinum electrodes by electrolysis in a solution of 3 per cent. chloroplatinic acid and 0·02 per cent. lead acetate. Such a platinised surface (or "platinum black" electrode) acts by virtue of its greatly increased surface and also by its catalytic action in combining the liberated hydrogen and oxygen.

Platinised electrodes are still commonly used in laboratory work, but it is possible to obtain satisfactory results with plain platinum or other noble metals, provided that fairly high frequencies (*e.g.* 1,000 c/s) are used. Industrial instruments use platinum black, platinum and other noble metals, noble metal plating on silver, and carbon.

Errors may also occur due to the capacity and self-inductance of the circuit, but suitable design can reduce these to negligible proportions. Conductance is also considerably influenced by temperature; as heat is generated by electric currents, applied voltages should therefore be kept very low. In an industrial instrument with a circulating solution, this source of error is automatically eliminated. The voltage applied also affects the rate of polarisation; depolarisation is more efficient at low voltages.

Cell Constants

The amount of current passed will obviously depend on the area of the electrodes and their distance apart, as well as on the concentration of the electrolyte and its temperature. This may be expressed:

$$k = \frac{1}{a.R}$$

where k = specific conductance of solution, R = resistance, a = area of two similar electrodes, and l = distance between them. The expression $\frac{l}{a}$ is constant for a given cell and this is called the *cell constant*. Since the area of electrodes cannot always be measured easily, this constant is usually determined by measuring the resistance of the cell with a solution of a certain electrolyte, *e.g.* potassium chloride, at a fixed concentration and temperature. The specific conductances of potassium chloride are given in Table 7. The relation is given by the equation

$$\frac{l}{a} = k \times R$$

or cell constant = specific conductance multiplied by resistance.

Thus one cell in $\frac{M}{10}$ KCl gave a resistance of 360 ohms at 18° C. so that the cell constant was:

$$\frac{l}{a} = 0{\cdot}01116 \times 360 = 4{\cdot}0176$$

Deposition on Electrodes

When conductivity cells are used over long periods in industry, it is sometimes observed that deposits or layers form on the electrodes and the cell constant value naturally rises since such layers increase the resistance. With detergent solutions a white deposit may form and this consists of the calcium and magnesium salts of phosphoric, silicic, and carbonic acids. It is, therefore, a typically hard water deposit, and the fact that such a deposit forms indicates that either the water should be softened or some sodium hexametaphosphate incorporated in the detergent.

Effect of Electrolyte Concentration

The degree of dissociation depends on the nature of the solute and the concentration. The more strongly dissociated the solute (*e.g.* hydrochloric acid, sodium hydroxide, and potassium chloride) the less is the effect of concentration on the equivalent conductance, or conductance of 1 g. equivalent. This is illustrated in Table 8. From the practical point of view of measuring the strength of solutions such as those of detergents, this means that the *specific* conductance of solutions of strong electrolytes, such as caustic soda, will vary fairly uniformly with concentration, but those of weaker electrolytes such as sodium carbonate and sodium phosphate will tend to show less differentiation because dilution will increase the degree of dissociation and hence the conducting power of the solution. However, since the concentrations used in practice are high (*e.g.* 1

TABLE 7

SPECIFIC CONDUCTANCES OF KCl SOLUTIONS

Temp. ° *C.*	*Molar.*	$\frac{1}{10}$ *molar.*	$\frac{1}{100}$ *molar.*
0 ..	0·0651	0·00713	0·000773
10 ..	0·0829	0·00932	0·001015
18 ..	0·0978	0·01116	0·001220
25 ..	0·1113	0·01285	0·001408

TABLE 8

EFFECT OF CONCENTRATION ON EQUIVALENT CONDUCTANCE OF ELECTROLYTES AT 18° C.

*Dilution.**	*1*	*2*	*5*	*10*	*100*	*1,000*
Strong electrolytes.						
Hydrochloric acid	300·5	326·6	341·5	350·1	369·3	377
Potassium hydroxide	184	197	207	213	228	234
Weak electrolytes.						
Ammonium hydroxide ..	0·89	1·35	2·30	3·3	0·6	28
Acetic acid	1·32	2·01	3·24	4·6	14·3	41

* The dilution is expressed as the number of litres containing 1 g. equivalent.

TABLE 9

CONDUCTIVITIES OF DETERGENT SOLUTIONS

	Concentration	Resistance (ohms) of standard cell at ° C.						
	%	15°	25°	35°	45°	55°	65°	75°
Sodium hydroxide	0·20	—	40	34	30	27	24	22·5
	0·38	26	22	19	16·5	15	13	11·5
	0·75	13·5	11·5	10	8·5	7·5	7	6
	1·50	7	6	5	4·5	4	3·5	3
	3·00	5·5	5	4	3·5	3	2·5	2·5
Sodium carbonate	0·5	—	—	44	36·5	31	27	24
	1·0	45	35·5	29	24	20·5	17·5	15·5
	2·0	22·5	17·5	14	12	10	9	8
	3·0	17	13·5	11	9	7·5	6·5	6
Sodium metasilicate ($5H_2O$)	0·5	—	—	—	—	44	39	36
	1·0	45	36·5	30·5	26·5	23·5	21	18·5
	3·0	17·5	14	12	10	9	8	7
Sodium phosphate ($Na_3PO_4.12H_2O$)	0·5	—	—	—	—	45·5	39	35
	1·0	—	—	38	31	26	22·5	19·5
	2·0	36·5	28·5	23	18	15·5	13·5	11·5
	3·0	28	21·5	17	14	12	10	8·5
Sodium hexametaphosphate	1·0	—	—	—	—	—	47	42
	2·0	—	—	41·5	35	30·5	26·5	24
	3·0	47·5	37	30·5	25·5	22	19	17
	5·0	32	25	20·5	17	14·5	13	11·5

per cent.) from the point of view of this *dilution effect*, this aspect does not significantly affect the problem.

Effect of Temperature

The conductances of all solutions are increased appreciably by rise in temperature (Tables 7 and 9). Roughly the conductance increases by 2 per cent. for every degree Centigrade rise in temperature, so that in the formula

$$\Lambda_t = \Lambda_{18}[1 + n(t - 18)]$$

n is about 0·02. At low temperatures, however, this linear relationship does not hold; conductances change less than that required by the formula and the curve tends to become asymptotic with the temperature axis.

Strong electrolytes like caustic soda usually have a lower temperature coefficient than weaker electrolytes, such as sodium phosphate. This complicates the problem of temperature compensation in any industrial instrument for the measurement of detergent strength. Since a difference of 10° C. can alter the conductance by 20 per cent., it is obvious that either temperature must be maintained constant or a temperature compensator introduced into the circuit.

Many ingenious devices have been used by various manufacturers for different types of problem. Fortunately, in detergent solutions, the caustic soda constituent (if present) dominates the conductivity of the whole, and so the error arising from the different coefficients of the different constituents tends to be swamped. For example, the ratio of conductances of caustic soda at 70° and 20° C. is about 1·9, whereas that for a typical mixture may be 2·2 or 2·3. The difference is thus not great.

Conductivity Measurements

The use of conductivity measurements as a method of measuring the strengths of solutions of salts, etc., has been known for a long time. Davis *et al.*[17] suggested that the conductivity properties of detergent solutions might be utilised as the basis of a detergent strength meter, and gave data to illustrate the differences in specific conductance of solutions of the common detergent constituents. In considering conductivity as a method for assessing detergent strength, it must be clearly realised that the conductivity of a solution depends upon the degree of dissociation of the solute, the charges on the ions formed by dissociation, and the mobility or speed of movement of these ions in the solution. Other factors may also exert an influence on the electrical conductivity of a solution, but the three properties mentioned are by far the most important. A further aspect from the instrument point of view is that in practice alternating currents are used and so capacity effects will also be a factor in the value obtained for the "conductivity"; with ordinary mains frequency of 50 cycles per sec. the capacity effect is very small, and in any case is approximately constant for common detergent solutions in the concentrations usually used.

Conductivity of Detergent Solutions

The principal detergent constituents, sodium hydroxide, sodium carbonate, sodium silicate, and trisodium phosphate, differ appreciably in the conductivities of their solutions. This is illustrated in Table 9, which also gives typical calibration data for some common detergents.

For any given instrument or conductivity apparatus, calibration is very simply performed by immersing the electrode in solutions of different strength at a constant temperature, *e.g.* 50° C., and either reading the absolute resistance in ohms or by obtaining an arbitrary meter measurement; *e.g.* if a 1 per cent. solution of caustic soda has a meter reading of 70 and a 0·5 per cent. a reading of 50, then it can be safely said that if dilution is the only change in the detergent solution, a fall in the meter reading from 70 to 50 indicates a fall in concentration from 1 to 0·5 per cent. Thus for pure unchanged solutions of alkalies or detergents there is a simple and constant relationship between concentration and *p*H, titratable alkalinity, and conductivity. In other words, a detergent solution of any given concentration will give defined and reproducible values for all these properties.

Unfortunately, as has been seen, dilution is only one method of change of a detergent solution. Even with straight caustic soda solutions, chemical changes due to carbonation, addition of acetic and other acids, etc., can lead to complex solutions of unknown composition for which it will be impossible to predict either their properties as mentioned above, or the relationship of these properties. For this reason a divergence between any two of these properties

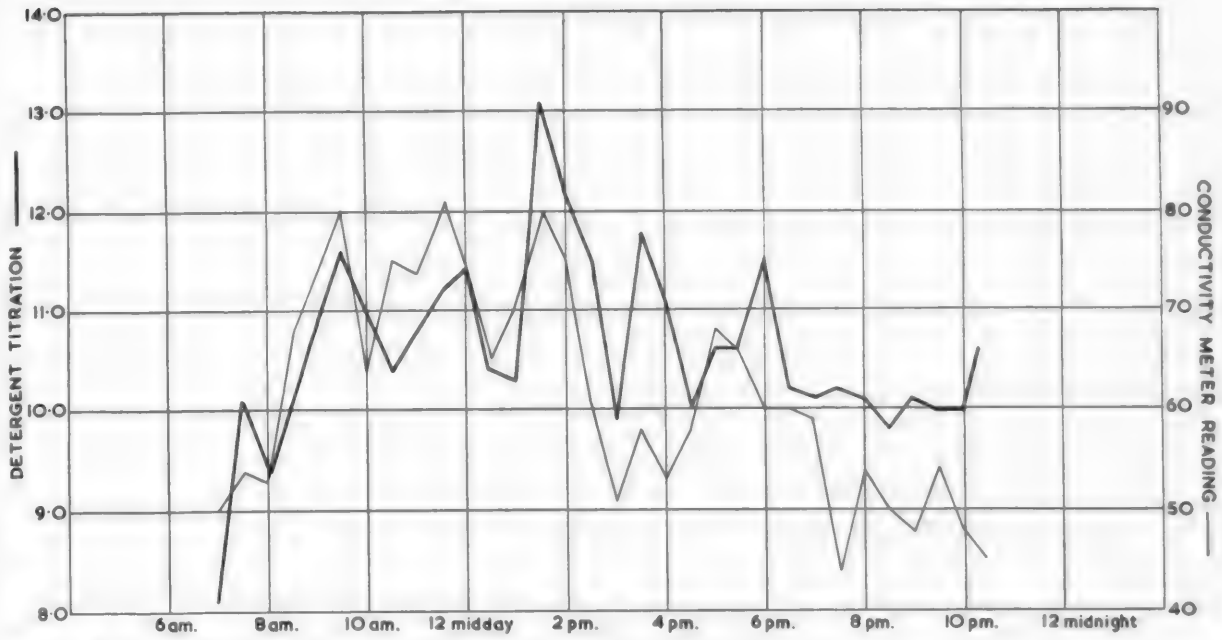


Fig. 2. Changes in titratable alkalinity and conductivity of detergent solution during use.

will become apparent as the detergent solution undergoes chemical change, and the more extensive this change the greater may be the divergence.

This point is illustrated in Table 5, which shows the effect of dilution, carbonation, and neutralisation of sodium hydroxide on the properties discussed.

For this reason attempts to find a simple relationship between conductivity and other properties, such as *p*H and titratable alkalinity, of a detergent solution in use are doomed to failure. Using conductivity we are measuring a property of detergents different from *p*H, etc., and so we shall inevitably find a difficult course of deterioration of the detergent. This fact has puzzled many people who have compared titratable alkalinities, etc., with conductivities of detergent solutions in bottle-washing machines and failed to get the agreement they expected.

Development of Instruments

A common mistake in developing instruments for industrial purposes, such as the one under discussion, is to attempt to make the instrument too accurate. Quite apart from the inherent errors in the instrument itself and such complications as temperature compensation, the property measured, *e.g.* conductivity, may not change linearly with the property to be measured, *e.g.* detergent strength or detergent efficiency, at any given moment. These two are not necessarily the same during the period of use of a detergent solution. Fig. 2 shows the changes in titratable alkalinity and conductivity of a detergent solution in use over a period.

Detergent Strength Indicators

In addition to detergent strength meters, which attempt to *measure* the strength of a detergent solution, there are available detergent strength indicators which *indicate* by means of a red lamp or bell only when the strength of the solution falls below a certain concentration. This point can be pre-set and this form of instrument has in comparison with the detergent strength meter the advantages of simplicity, robustness, and cheapness. Probably its chief drawback is that it gives no indication of how much over strength is the detergent solution, so that it would not prevent an unnecessary and wasteful consumption of detergent. However, in view of the fact that the usual trouble is that detergent solutions are allowed to become too weak to function efficiently, this is not, perhaps, a very serious matter. The instrument can be adapted to indicate when a certain over-concentration has been reached.

Fig. 3. Detergent concentration indicator. *Photo Ionic Instruments (London).*

Fig. 3 shows a recent type of detergent concentration indicator, and Fig. 4 gives a typical circuit for such an instrument.

Interpretation of Results

The points which have been raised will make it evident that the interpretation of the results of any test for measuring the strength of a detergent solution is not a simple matter. We cannot even

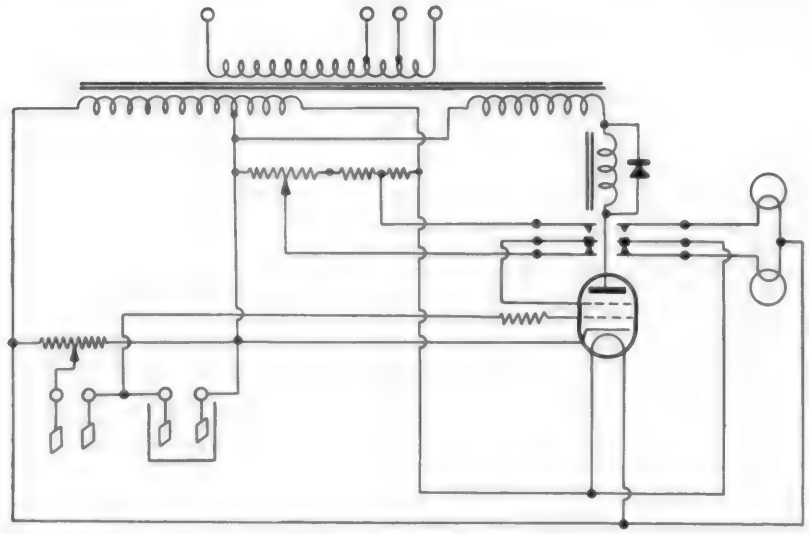


Fig. 4. Detergent concentration indicator circuit diagram.
Courtesy Ionic Instruments (London).

speak of a percentage fall in detergent strength for the reason that weakening by dilution, and also chemical changes due to carbonation, etc., are always present. It is impossible, therefore, to attach a rigid significance to any value obtained in detergent solutions, irrespective of the particular test used. Great accuracy cannot be attained and should not be attempted. The whole basis of testing, calibration, and interpretation must be on an empirical basis. In other words, using any one detergent, we find by trial and error within what limits the solution must be controlled by any one method in order to give satisfactory results.

Sources of Error

There are several sources of error in measuring detergent strength which are not always realised. Some of these are more important with some methods and may be negligible with others.

Aeration

All detergent solutions receive considerable aeration, especially if the machine is of the jet type. Leaking glands in pumps are always a contributory factor and often result in extensive foaming, or as it is so often incorrectly called, "fobbing," which is not only very objectionable, but also results in waste of detergent. If a method of testing is used in which a sample is taken from the machine and removed to the laboratory for testing, bubbles of air will by then have escaped and so no serious error is involved. The *p*H method is independent of extraneous air bubbles, but specific gravity, titration, and conductivity will be appreciably affected by such entrainment. The extent of aeration in the actual detergent solution can be roughly estimated by inserting a piece of glass tubing in the pipeline between the pump and the jets. Large numbers of air bubbles can often be seen in such a pipeline. These air bubbles will naturally have a considerable effect on the conductivity recorded. The pointer of a detergent strength meter is sometimes seen to wander appreciably, and such wandering can usually be correlated with aeration of the detergent solution.

From what has been said already it will be clear that changes in any detergent solution are unknown, although broadly speaking the important types of change are known when the detergent is used for a specified purpose, *e.g.* cleaning milk bottles. Some typical analyses illustrating the nature of the deterioration of a detergent solution are given in Table 10. Such analytical figures will naturally vary each time a series of tests is made. The effect of milk is illustrated in Table 11.

Because chemical changes in a detergent solution are complex and non-reproducible, there is a definite limit to the accuracy of any test, no matter what it is, for measuring the strength. In other words, if a solution of known concentration of a pure substance such as sodium hydroxide or of a detergent mixture is put into use, and after an hour's use a value by some test such as *p*H, titration, or conductivity is obtained, it is impossible from that one value to describe the true composition of the detergent solution at that moment on account of the complexity of the changes which the detergent constituents have undergone.

Errors of Indicators

If a *p*H indicator is used and the greatest possible accuracy is desired, it is essential to use one which is stable at the *p*H of the

TABLE 10

TYPICAL ANALYSES OF BOTTLE-WASHING DETERGENT SOLUTIONS SHOWING DETERIORATION IN USE (ADDITION OF DETERGENT FROM TIME TO TIME)

Sample No.	*1*	*2*	*3*	*4*	*5*	*6*
Time sampled	6.15 a.m.	9.35 p.m.	6.15 a.m.	10.30 p.m.	6.35 a.m.	10 p.m.
Day of use	1st.	1st.	2nd.	2nd.	3rd.	3rd.
NaOH (by conductivity)	0·33	0·25	0·19	—	0·22	0·25
NaOH (% by analysis)	0·42	0·38	0·24	0·41	0·24	0·36
Na_2CO_3 (% by analysis)	0·05	0·08	0·07	0·10	0·06	0·10
P_2O_5 (mg. %)	1·9	2·3	1·4	2·2	0·88	1·8
SiO_2 (mg. %)	45	60	21	45	30	45
Protein (N×6·38 mg. %)	10·8	17·3	10·8	31·8	15·5	11·3
Total fat (mg. %)	1·1	11·4	3·7	11·7	4·2	18·5
*p*H	12·3	12·3	12·2	12·3	12·2	12·2
Titration with $\frac{N}{10}$ acid:						
(*a*) to phenolphthalein	11·2	10·4	6·5	11·4	6·7	10·0
(*b*) to methyl orange	11·7	11·4	7·4	12·5	7·5	11·1
Solgon % (by conductivity)	0·6	0·46	0·35	—	0·39	0·46
Solgon % (by titration)	0·62	0·58	0·36	—	0·37	0·56

solution under test. Further, the corrections must be made for specific errors such as those due to salt concentration, protein error, etc. These can usually be ignored in the weaker type of detergent solution. Temperature can naturally produce an appreciable error and, if possible, colorimetric measurements should be made at a fixed temperature, *e.g.* 18° C.

If a *p*H meter is used, particular attention must be given to the following points:

1. Accuracy of standardisation.
2. Constancy of behaviour of the glass electrode and especially the absence of a fat-protein film. The latter is unlikely to occur when using an electrode in detergent solutions.
3. Equalisation of temperature in both electrodes and solutions.
4. Electrical stability of the *p*H meter.

Conductivity Measurements

If a conductivity method is used, errors may arise from the following factors:

1. Changes in the K value of the conductivity cell or pair of electrodes. Polarisation is unlikely to be a worry when alternating currents of sufficiently high frequency are used, but deposition of the sludge or sediment on the electrodes (almost invariably found in detergent solutions) will increase the resistance and so result in a lower conductivity being recorded.
2. It is essential either to standardise the temperature when making the conductivity measurement or to have an accurate temperature compensating device. With different types of detergent and wide ranges of temperature, *e.g.* 100° to 160° F., the problem of temperature compensation is a difficult one and usually an average compensating effect has to be accepted as a compromise. With the common detergent solutions a rise of temperature of 1° C. will result in an increase of 2 per cent. in the conductivity (Table 9). Thus without temperature compensation a change of 20° C. will result in a change in conductivity of 40 per cent., which is a serious error.
3. Electrical stability is a *sine qua non* in conductivity apparatus as in all similar types of electrical equipment. In general null point methods are simpler and more reliable, and circuits are more stable than meter methods, where measurement is attempted.

TABLE 11

EFFECT OF DILUTION AND ADDITION OF MILK TO DETERGENT SOLUTIONS
(ALL DATA FOR 18° C.)

Sodium hydroxide:	*Resistance with standard cell.*	*Titration of 20 ml. with* $\frac{N}{2}$ *HCl.*		*pH.*
		Phenolphthalein.	*Methyl orange.*	
1%	68	9·8	9·9	13·0
0·5%	126	4·9	4·95	13·0
0·5%+1% milk ..	131	4·85	4·9	—
0·5%+1% milk after 10′ boiling ..	143	4·35	4·75	—
Sodium carbonate:				
1%	247	4·0	7·35	11·3
1%+1% milk	252	3·75	7·25	—
1%+1% milk after 10′ boiling ..	258	3·3	7·2	—
Sodium metasilicate:				
1%	283	3·45	3·8	12·5
1%+1% milk	291	3·35	3·75	—
1%+1% milk after 10′ boiling ..	332	3·0	3·6	—
Trisodium phosphate:				
1%	336	1·65	3·65	12·0
1%+1% milk	338	1·55	3·6	—
1%+1% milk after 10′ boiling ..	340	1·3	3·5	—

Errors due to Temperature

The effect of temperature changes varies with the method of testing. For all practical purposes titratable alkalinity is unaffected, specific gravity is appreciably affected, and conductivity seriously affected by variation in temperature. *p*H measurements are also affected according to the type of indicator or electrode used. If at all possible *p*H measurements should always be made with the whole of the apparatus, electrodes, and solutions at a fixed temperature, *e.g.* 18° C.

After due study of the scientific basis of detergency and consideration of those properties of detergent solutions which are of importance in determining their efficiency, such as *p*H, wetting power, surface tension, emulsifying power, rinseability, etc. (Table 12), it might well be asked what relation any of these tests have to the effectiveness of the detergent solution. It is not possible to give a simple answer to this question. Those who are interested may consult an article by Resuggan[7] from which it will be seen that no one property gives the whole story as far as detergent efficiency is concerned.

The modern practice is to formulate detergents for a particular job, and constituents will be introduced to achieve certain purposes, *e.g.* sodium hydroxide for bacterial killing power, emulsification, and lubricating powers, silicates as emulsifiers and to inhibit attack on aluminium, phosphate to soften hard water and improve rinseability, sulphite to inhibit corrosion of tin, etc. Dilution will weaken all such constituents at the same rate but the chemical changes undergone will vary considerably. Thus sodium

TABLE 12

SPECIFIC PROPERTIES OF VARIOUS DETERGENT CONSTITUENTS

	Sodium hydroxide.	*Sodium metasilicate.*	*Trisodium phosphate.*	*Sodium carbonate.*	*Sodium hexametaphosphate.*	*Siliceous silicates.*	*Soaps.*	*Synthetic organic wetting agents.*
Caustic alkalinity	++++	+++	++	++	o	+	+	o
Wetting	+	++	+	++	+	+++	++++	++++
Deflocculating and emulsifying power	++	+++	++	++	+++	+++	++++	++++
Rinsing	+	++	+++	++	++++	+++	+	+++
Water softening	o	+	+++	+	++++	+++	o	+++
Sterilising power	++++	+++	+++	++	o ?	+	+++	++
Buffering (resistance to lowering of *p*H)	++++	+++	+++	++	▫	+	o	▫

hydroxide will absorb carbon dioxide, polyphosphates and silicates may hydrolyse, while ordinary carbonates and phosphates are fairly stable. While the gradual weakening of the detergent will in general reduce its efficiency in respect of its specific physical purposes enumerated above, there are some exceptions. For example, hydrolysis of fats by hot caustic soda solutions will result in the liberation of fatty acids and the formation of soaps with the consequent increase in emulsifying power and a lowering of surface tension.

Summarising the points which have been discussed, it may be said that all recognised methods of measuring detergent strength have their advantages and disadvantages. The choice of method will depend largely upon the scale of operation, *i.e.* whether an expensive instrument is justified, and especially on the proximity of a laboratory or the presence of a chemist. It is a fallacy and, in fact, unnecessary to attempt to measure the strength of a detergent solution too accurately. All that is required is to determine that point at which a detergent solution ceases to be efficient and then to choose the most suitable method for ensuring that the strength is maintained above this level.

Automatic Dosage

The use of a detergent strength meter or indicator inevitably promotes the thought of an automatic dosage equipment, which would automatically maintain the detergent at its required strength. The idea is a very attractive one, but there are certain difficulties to be overcome.

There are three main ways of adding detergent to a tank:

(i) By adding the powdered detergent with a shovel or hopper.
(ii) By the addition of tablets or cakes of compressed detergent.
(iii) By running in a concentrated detergent solution.

The addition of detergent by means of a hopper would be impracticable unless some special screw injection method were employed on account of the hygroscopic nature and caking properties of nearly all detergents. For example, caustic soda is strongly hygroscopic and sodium metasilicate and sodium hexametaphosphate cake to form a hard mass which is very difficult to break up. While means can be devised to make the idea practicable, the nature of the equipment and the precautions that would be necessary would be so involved that the expense would be considerable.

The tablet or cake method would overcome some of the objections to the hopper method, but would have its own peculiar problems. It would be necessary for the detergent manufacturers to make these special cakes of their detergents, the machine for adding the tablets to the detergent tank would be expensive, and the hygroscopic nature of the detergent cakes would undoubtedly lead to complications. It may be considered, therefore, that both these methods are virtually impracticable, mainly on account of the fact that detergents absorb water from the atmosphere. In addition, they will absorb carbon dioxide and so weaken in storage unless precautions are taken to exclude air.

A further problem inevitable with the addition of either powder or tablets would be the fact that detergent powder and tablets would fall to the bottom of the tank, and since, in certain types of machine, the agitation of the detergent solution is virtually nil, the resultant concentration would be very uneven throughout the solution. It is, in fact, possible to see by inspection under suitable conditions the strong detergent solution remaining at the bottom of the tank.

The third method, involving the preparation of a concentrated solution, is the most attractive, but those experienced in the use of detergents will be familiar with the problems that would arise. Either the tank would have to be above the washer or a pump would have to be installed to force the strong solution into the washer. A further difficulty is that the constituents of modern detergent mixtures vary considerably in their solubility. For example, caustic soda is extremely soluble, while some of the phosphates are much less soluble. The degree of concentration which could be used would therefore be determined by the solubility of the least soluble constituents. Further, changes in temperature, evaporation, etc., might lead to the precipitation or crystallisation of the less soluble constituents, which could not only lead to failure of the equipment to deliver the detergent solution, but could result in damage to pumps. Moreover, such a strong solution would weaken readily by absorption of carbon dioxide from the air.

With very soluble substances like caustic soda this method should be quite feasible. With detergent mixtures containing constituents of low solubility, there would be a limit to the concentration of the feed solution. The actual mechanism of operation could be quite simple. The detergent concentration indicator would operate a relay at a certain conductivity which would open a valve or start a pump.

ACKNOWLEDGMENT

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Food Packaging

Progress in 1950

FRANK ENGLAND

The greater part of 1950 saw the continuation of steady progress in all aspects of the packaging industry, checked only by the worsening international situation caused by the hostilities in Korea. This leaves the industry faced with problems associated with both the British defence programme and that of the Western world. The future keynote must be one of co-operation between the Government, the industry, and the user.

A REVIEW of the year's progress in packaging or in any other department of industry must be considered chronologically. The next step is to assess the importance of the various developments that have taken place, and present them in the order of importance.

During the year under review, neither of these procedures can satisfactorily be adopted, for the industry received a sudden and unpleasant shock resulting largely from the outbreak of hostilities in Korea, the general deterioration of the international situation, and the decision of the Western world to rearm.

Up to September, there seemed to be every hope that 1950 would be a year of continuous progress in every department of packaging. Experiments were being carried out on a wide scale, manufacturers were continuing to examine and improve their packs, and, in the home market, shop displays were providing increasing evidence of a return to higher standards.

Return to Shortages

September brought unwelcome indications of a return to shortages and renewed controls. The shortage of iron and steel, notwithstanding increased production, will be aggravated by the requirements of the defence programme, the effects of which cannot be easily envisaged.

One aspect of this anticipated shortage is reflected in the development in 1950 of polythene as a liner for cases of fibre and other materials, which would offset the shortage of metal drums. It is natural to ask whether this use can be extended to meet the threatened iron and steel "famine."

The development of plastics is itself threatened by the shortage of sulphuric acid owing to the cutting down of imports of sulphur from dollar areas. It is not likely that the closing of the "dollar gap" will mitigate this position.

Paper and Board Supplies

A difficult situation also arises in connexion with fibreboard. In part, this is related to the breaking by the Government of Canadian contracts for the supply of pulp and paper, the high price of Scandinavian pulp, and the fierce international competition for supplies.

Those connected with the packaging industry are only too well aware of the myriad uses of paper and board which a defence programme calls for, and these difficulties are further aggravated by the stockpiling that is going on in meeting the requirements of the American defence programme.

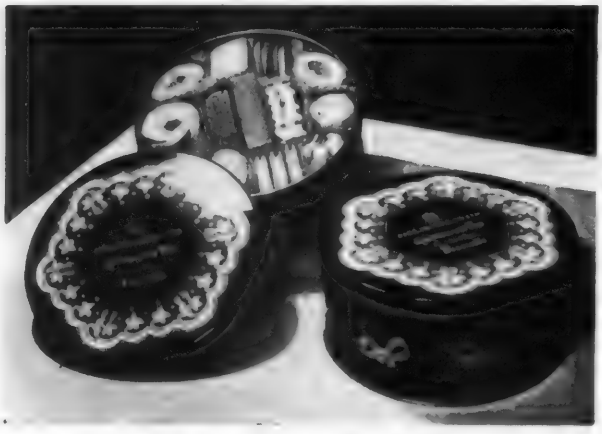
The food and confectionery manufacturer, therefore, may expect to see a deterioration in quantities and qualities available, in addition to cuts in licences for paper and board. Manufacturers who want board for increased export trade requirements will have to meet them from their supplies for the home market.

The board position has not been helped by the cessation of waste paper recovery by so many local authorities. The launching of a campaign for paper and board salvage will help, but it may not be easy to restore the sense of urgency that inspired war-time collections, and it will take time to achieve any marked advance.

Availability of Foil Papers

One immediate impact of the present supply situation will be a reduction in the use of foil papers and aluminium which were beginning to brighten so many packs. "Window" packs may disappear, in which case dollar export

Designed for the American market, this pack was based on a fact-finding research conducted in the United States.



Export tin for Peek Frean's Afternoon Tea Assorted Biscuits and a new range of packs for pickles. These packs and the one on page 59 were designed by Richard Lonsdale-Hands.

trade may suffer since the American shopper strongly favours this type of pack.

Viscose film production has already been cut by 20 per cent. Plastic closures and other forms of plastics employed in the industry will be affected by the shortage of raw materials.

Self-service Stores

There is some speculation as to the effect the deterioration of packaging material will have on the development of the self-service store. Attractiveness of the pack is a big factor in self-service selling, particularly in relation to "impulse buying," which has such an important bearing on turnover. Another point of importance is the ability of packs to stand up to handling by the self-service shopper. A sidelight on the importance of the pack in the self-service store is provided by the increasing attention paid by designers to the production of packs especially to meet self-service requirements.

The jute situation continues to be unsatisfactory owing to the currency dispute between India and Pakistan which holds up shipments.

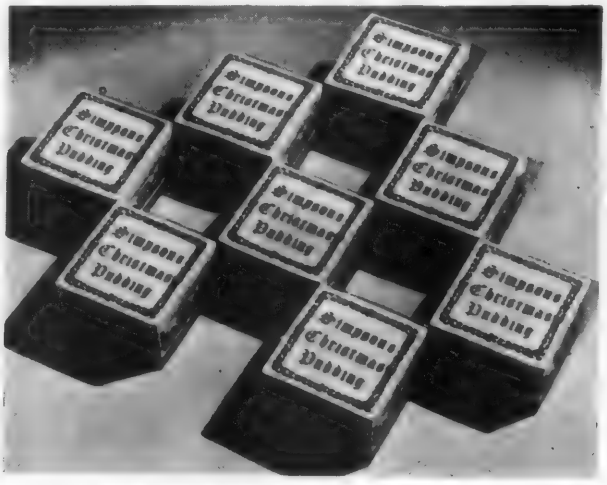
There is some hope of slight improvement in the timber supply position. In 1939, some 2½ million standards were imported. In the year under review, the import figure was 1 million standards, but for 1951 there appears to be a prospect of an increase to 1¾ million standards.

The effects of these shortages will not be felt at once; some firms have accumulated fairly large stocks of the materials they need. The problems occasioned by shortages, both present and impending, can at least be mitigated by co-operation and understanding between the Government (who will no doubt impose some controls on materials), the various sections of the packaging industry, and users. Steps are already being taken in this direction.

Packaging Exhibition, 1951

The Packaging Exhibition provides an unrivalled opportunity to assess the present supply situation and to explore the possibilities of finding alternatives.

Meanwhile, it is encouraging that the number of exhibitors will exceed that of the first exhibition in Manchester by 55 per cent.,



Simpson Ready Foods pack for Christmas puddings designed by Frank Mortimer.

Maconochie's Scotch Herrings in Tomato and Green Tomato Catsup packs designed by W. S. Crawford.

and that the area covered will be at least double.

Among the evidences of progress in 1950 is the completion at Newport, Monmouthshire, of the Monsanto plant for the manufacture of their Lustrex polystyrene. In the United States, this has wide uses, including the production of discardable containers for fruit and vegetables.

For the present, production at Newport depends on imported styrene monomer, but the company is jointly associated with British Petroleum Chemicals in the comparatively recently formed Forth Chemicals for the production of styrene monomer at Grangemouth.

In the development of polythene liners for fibreboard drums, the British Standards Institution, in association with Patra laboratories, produced a standard for their manufacture. It is a tight standard in which the user of polythene liner containers can have every confidence.

An interesting service offered by the Research and Development Division of British Cellophane has been the issue of a series of practical guides to the uses of regenerated cellulose film. Subjects dealt with include the direct wrapping of sweets, dates, and table jellies, the fading of printing inks, and the packaging of metal and general storage conditions.

Development of New Packs

New packs developed in 1950 for Maconochie's include their Scotch Herrings in Tomato, Mutton Hash, Concentrated Tomato Soup, Concentrated Cream of Chicken, and their Green Tomato Catsup.

In the first four, full colour is used to suggest immaculate freshness and quality. Lettering is clear and is legible at a considerable distance. By contrast, the label for the Green Tomato Catsup bottle is restrained in appearance, which suggests a somewhat exclusive product catering for the tastes of a limited market.

Other manufacturers who have paid attention to their sauce packs are Fletchers of Selby, whose label has been re-designed for the home and export markets; and the makers of H.P. Sauce, who have had a bottle pack only 5½ in. in height and made of "lightweight" glass specially produced for airline travel. The labels are printed in French, Spanish, and German. At the moment, the pack is exclusively used by British European Airways and the British Overseas Airways Corporation.

A new Peak Frean Christmas pudding pack was designed for the American market based on the results of special research in the United States. Their Afternoon Tea Assorted Biscuits were packaged in a new tin with a simple but brightly attractive combination of colours to offset the bold design.

New pack for processed Cocktail Nuts designed and printed by Reads of Liverpool.

Lea and Perrins have released a new pack for their Tomato Juice Cocktail for home and export markets, with label colours dark blue, red, and gold.

Printing on Metal

Mention should also be made of the appearance on the market of processed food cans without the familiar label, but with decoration printed direct on to the metal. This has been made possible by research carried out in the laboratories of The Metal Box Company at Acton, where the special inks required were formulated. The problem of evolving inks which would withstand the action of water and steam at 240° F. for at least one hour were considerable. The containers were printed before fabrication, filling, and processing.

Construction of the new tinplate works of the Steel Company of Wales at Trostre is making excellent progress, and it is expected that finished tinplate will begin to flow from the plant in June, 1951.

The Tin Research Institute records steady progress in 1950, and an expanded programme of research will be facilitated by the opening of the new extensions early in 1951. The production by the Institute of their *Tinplate Handbook* has proved a helpful guide for buyers and users of tinplate. Revised instructions have also been published for the Protecta-Tin process. In a practical adaptation of the process in use at the London works of Brand and Co., in which the filming operation is combined with retorting, a notable improvement in exterior rust-resistance of the cans is obtained.

Packaging in Germany

WHAT appears to be a satisfactorily comprehensive survey of packaging methods and materials in Germany during the period 1939-1945 is contained in B.I.O.S. Report No. 31, 1950,* prepared by Miss A. E. Wiegand of the British Standards Institution.

This is one of the surveys that has been prepared from published reports in the B.I.O.S., C.I.O.S., F.I.A.T., and J.I.O.A. series, and includes reference to appropriate unpublished documents. Even at this date much of the information may still be of value to industry.

The contents are divided into nine chapters dealing with paper, board, parchment, films, and foils; metal containers; plastics; glass; textiles; adhesives and adhesive tapes; rot- and fire-proofing, and corrosion prevention; food packaging; and filling machinery.

There are thirteen plates of machinery and packages of German manufacture.

* *Packaging in Germany during the Period 1939-1945.* British Intelligence Objectives Sub-committee Surveys Report No. 31. Pp. 61. H.M.S.O., London. Price 2s.

British Views on American Packaging

The United States spends $8,000,000,000 annually on packaging its products. To study the design, appearance, cost, and general effectiveness of the results of this vast expenditure a specialist British team went to the U.S. under the sponsorship of the Anglo-American Council on Productivity. The general conclusions and special observations of the team with regard to packaging are contained in a recently published report.

"IN PACKAGING the British make as well as they know how and the Americans as well as need be." This is one of the comments quoted in the report of the productivity team which visited the U.S. early in 1950 to study American packaging and in which is given an admirable survey of American packaging materials and methods, comparing these with current British practice, often to the latter's detriment. Although the fullest allowance is made for shortage of materials and the austerity conditions in Great Britain, the report emphasises the danger of attributing the level of efficiency in American factories to the numerical size of the home and export markets. Distances and the high cost of transport reduce the effective radius of distribution from a given factory to something much nearer conditions in Great Britain than is generally admitted. The touchstone is not so much the number of consumers as the high purchasing power of that number. The report also attacks the current notion that in the U.S. novelty is the be-all and end-all of a good pack. Novelty has its place, but the first requirement for any pack is that it shall be suitable for the product and the market.

Use of Corrugated Fibreboard

In a country where raw materials are easily obtainable, considerable ingenuity is displayed in their use for packaging different commodities. Corrugated fibreboard, for example—in short supply in Great Britain—is very widely used. Some manufacturers have their packages—*e.g.* bottles, tubes, cartons—delivered in the outer corrugated fibreboard case which is to be used for the despatch of the final product. While the unit packages are being filled, the emptied cases are conveyed to a point adjacent to the filling or packaging line. The filled packages are placed in the cases by machine and the loaded cases pass, *via* a closing and glueing room, to the packed stock room, thus saving a considerable amount of storage space. Another space-saving device is to have the fibreboard blanks only delivered to the factory. These are then stitched on the firm's own machines as required.

Very few instances were seen of the use of solid fibreboard. It is used to a limited extent for packing small quantities of drugs, and metal-edged solid fibreboard boxes are used for mailing samples of drugs or materials of small bulk such as penicillin and streptomycin.

Tins and other Metal Containers

There have been few changes during the last fifteen years in the general range of types and sizes of tins. Among those of particular interest were the following usages:

Eight times more tins than glass bottles are being made for packing beer in the U.S. The advantages are considerable, especially when, as in the U.S., the beer is drunk cold. Tins are not returnable; the sizes are 12 and 32 fl. oz., and carton makers have now produced a carrier for six 12 fl. oz. tins of beer. Bottle makers are replying by developing a light-weight, one-trip beer bottle.

Fruit juices are still largely packed in tins, the latest development being concentrate-freezing in sealed 6 oz. tins, reconstituting to 1 U.S. qt.

Soluble coffee (as distinct from roasted and ground coffee) is packed both in glass and in tins, opinion being divided on the relative merits of the two methods.

In the use of tins in America the emphasis is on limited increments of size within each product, and a series of basic types of container in order to permit the use of automatic, high-speed packing machines.

Standard closures are used even on special containers (*e.g.* the Log Cabin sugar pack), and the closure is selected on the two interdependent characteristics of function and high-speed application.

Quality of Tinplate

The quality and apparent abundance of cold reduced (strip mill) tinplate impressed the team. The quality and low-cost production of tin in the U.S. is being aided by the technical excellence of the basic raw material—even gauge, square, consistent working properties, smooth, clean surface for lithography. This material is not only better but cheaper than the hot mill (pack rolled) plate in general use in the United Kingdom for all but special purposes. The saving in cost is not just in the material itself, but in the higher production speeds which can be attained with a consistent raw material having the appropriate properties.

Metal Drums

The team had little opportunity of seeing metal drums in use in the U.S. Mention is made, however, of steel drums seen at one chemical plant. They were fitted with a special polyethylene pourer which, being plastic, can be depressed into the drum when not in use. Sponsored research is being carried out at the Battelle Memorial Institute to develop materials and methods of application for internally coating drums.

Prepackaging for Self-service

The evolution of the self-service store is moving towards the stage where it might be termed the "impulse purchase" store. More and more new categories of produce and foodstuffs are brought into the prepackaging orbit and in gay, attractive packs.

Current American practice includes not only groceries but a whole range of provisions presented ready packed for the customer's choice. Table meats are offered in transparent cellulose film wraps; cheese is packed in or prepared in films and foils which replace the wasteful rind. Sliced Gruyère cheese is put up in a vacuum pack of transparent plastic film which prolongs shelf life. This pack is also used for bacon.

Special machinery is being developed for prepackaging lettuce and celery, but the main problem of the mechanical handling of plastic films remains. Poultry is also being sold prepacked, both "jointed" and whole birds; one method known as the Cry-o-Vac uses a plastic film wrap. The film used is Saran (polyvinylidene chloride) made by the Dow Chemical Company, the Cry-o-Vac process and machinery having been developed by Dewey and Almy.

Bakery goods are packed in window-type packs for self-service with the obvious resultant hygienic advantages.

Packaging Meat for Self-service

The development of self-service for the sale of red meats is still in the early stages. Where it has been introduced it is welcomed by the customers. Cuts and joints of fresh meats are prepackaged in transparent cellulose film wrappings and displayed in refrigerator display service cabinets. The main difficulty, still being tackled, is spoilage by discoloration due to exposure to light, which reduces profits. A special cellulose film, L.S.A.T., having an anchored coating on the outside only, and suitable for heat-sealing, is used together with a sulphite backing board or pulp tray.

Labels showing weight, unit price, and price of the cut are heat-sealed on to the face of the package.

Plastics in Packaging

As in Britain, the use of plastics in packaging is making considerable strides in America, although, against the packaging background as a whole, their use is, as yet, comparatively small. The following plastics were seen in use for packaging:

Thermo-setting:	Phenolics
	Ureas
	Melamines
Thermo-plastic:	Acrylics (Perspex)
	Cellulose acetate
	Cellulose aceto-butyrate
	Ethyl cellulose
	Polyvinyl chloride and vinyl co-polymer (chloride-acetate)
	Polyvinylidene chloride (Saran)
	Polyethylene
	Polystyrene
	Rubber hydrochloride (Pliofilm)

In addition, there are several other plastics, *e.g.* nylon, S-polymer (styrene, *iso*butylene co-polymer), whose use in packaging is being examined.

The six main applications of plastics in packaging are: (1) as film; (2) in fabricated containers; (3) as moulded containers; (4) as closures; (5) as coatings; (6) in adhesives.

Glass Containers

With the general abundance of raw materials for packages in the United States, the glass container meets considerable competition. With the development of the self-service stores and the increasing practice of the carrying home of their purchases by customers, weight and space factors are important.

Glass containers still hold the advantage in cost, the ratios being about 5 : 4 : 3 for cans, returnable beer bottles, and one-trip beer bottles, respectively, for the same capacity container. This ratio is, of course, varied somewhat by lower transportation and handling costs in the case of cans.

The non-returnable waxed paper carton is a competitor of the glass milk bottle, notably in the self-service stores and canteens. The glass bottle still has the advantage in price, even when costs of transportation, handling, and washing of bottles are taken into account. Although about three times as dear as the carton, the bottle makes twenty-five to thirty trips.

The development of the square section milk bottle, giving ease of storage and economy of space, is outstanding. The space saving is probably most significant in relation to the cost of transportation in refrigerated containers or vehicles, which are the rule rather than the exception in the U.S.

One application of glass, in which considerable progress is stated to have been made, is in the packing of strained baby foods. This is a rapidly expanding industry in the U.S., the common sizes at present being the 5 oz. and 8 oz.

The development of the self-service store will doubtless encourage the use of glass containers for prepared foods, more particularly the higher qualities, and notably diced and whole vegetables.

The use of tumblers for the packing of such things as jam, cheese, ice cream, and tea, with subsequent re-use value, is common.

On the other hand, the use of glass jars for the packing of coffee has not been successful, except as a war-time measure. Practically all the coffee on the market is now packed in tins or in paper containers.

Closures

In the drafting of standard neck ring finishes by the Battelle Memorial Institute, the fact that closure manufacturers are members of the Institute and are represented on its Container Design Committee is of obvious value.

The design of the closure and of the finish of the container is thus a co-operative effort which ensures a good fit on the completed article.

The Crown Cork is now universal on beer and mineral water bottles.

For milk bottles, the most common closure is the waxed paper disc, completed (compulsorily)

by means of a hood over the top of the bottle. The aluminium cap as used in Britain is also common, and a third type, made of tinplate, is used, but is less popular.

With regard to food containers, the use of the "vapour-vacuum" process was stated to have developed rapidly, including its use for sauce bottles, mainly on account of the possibility of much higher filling and capping speeds than with screw caps. For example, filling speeds of 300 to 350 a minute can be attained by this process. Vapour-vacuum sealing of jam jars is also widely practised.

A snap-on, moderately flexible polyethylene cap has been developed by the largest glass manufacturer as a closure for glassware containing dry powders. This has been used, for example, on the coffee jar.

Standardisation

Standardisation and simplification as seen in the U.S. are described as nothing more than means towards mechanisation. Standardisation of type and style of package was more evident than that of size, and handling of a range of sizes appeared to be feasible, but the team observed a policy of restricting the number of sizes for reasons of cost. Cleverness of design prevented American packages from looking alike, although most of them were based on standards.

Introducing a survey of layout, machinery, and methods seen in the U.S., the report states that while much of the very high-speed machinery employed to meet the demands of mass selling in an enormous home market would have little application in Britain, machines are also available which combine high operating speed with a much greater degree of versatility than is usually found in those produced in Britain. There is a real need in many industries in Britain for machinery of this type, and where it is not available from British manufacturers, the expenditure of dollars to obtain such plant from the U.S. would be amply justified.

The team states that to obtain volume production, high-speed packaging lines are essential, and it is not uncommon for money to be spent on the package in order to save money on the complete operation. Market research polls have revealed that one or two universal types of American package are not popular, but the manufacturers realise that these are preferred to some more acceptable packages at a higher price.

Research

All the designers and design units seen by the team carry out extensive market research before beginning the decoration of a package. This is something few British designers undertake, yet it is essential that the products of competitors on the American market should be examined if competition with them is to be successful. British manufacturers must ensure that their packages can be distinguished from similar goods of other makes, and that they display better when massed on the store shelf. The team urges that British goods should proclaim their origin and character with dignity and clarity; this requires a working knowledge of the American idiom and customs, which can be acquired only in the U.S.

Although the team could not make a full survey of packaging research, sufficient was seen to prove that, while it is along lines similar to that in Britain, it is far more extensive. Of the U.S. packaging industry's annual turnover of $8,000 million, a figure of 1 per cent. ($80 million) is probably below the actual expenditure on research. There are research facilities available to every firm in Britain, and the team strongly recommends that much greater use should be made of them.

Progress in British Packaging Research

An income of £29,817 from members (the highest on record), a grant of £17,800 from D.S.I.R., and expansions of research and other services at a cost over £3,000 in excess of income are recorded in the twentieth annual report of the Printing, Packaging, and Allied Trades Research Association for the period April, 1949, to March, 1950. This was presented at the annual general meeting on December 19, when Mr. G. M. Ashwell, chief packages adviser to I.C.I., was elected chairman of the Council.

In its first full year in the new research centre at Leatherhead, Patra has carried much of its research to the point where immediately applicable results have been produced.

In the packaging division, study of the strength of containers has continued, and a device to measure and record shocks to a package in transit has been developed. Apparatus for measuring the water vapour permeability of low-permeability materials has been designed, and tests made of an instrument for low-temperature measurements.

Measurement of the moisture-protective qualities of packages by a method developed by the Association has been made practicable, and a report on the methods used for estimating the shelf life of packages has been prepared.

A method of measuring the water penetration of thin papers has been evolved, an apparatus for testing the gas permeability of packaging materials has been made, and standard routine tests of oil and grease penetration have been evolved and are used in the package-testing laboratory. New fungicides and insecticides are continually being tested at the research centre and many enquiries have been answered concerning the cleanliness of board used for food packaging.

Plans for the future include the setting up of a laboratory to develop the application of electronics to printing and packaging, the appointment of a research engineer to survey the industry's mechanical problems, and the setting up of a radio tracer laboratory.

New terms of Government grant are being negotiated, as the five-year period of the existing D.S.I.R. grant arrangement expires in March, 1951. The Association will probably be required to raise a higher industrial income to qualify for a future grant, and a special sub-committee is considering ways of raising the grant-earning income.

The British Packaging Industry Shows its Wares at Olympia

BARRIER PREPARATIONS

Engaged in research into the problem of industrial dermatitis for a quarter of a century, Rozalex are now in a position to provide a preparation that will guard against almost all the known causative agents of skin affections. A full range of these barrier preparations is featured on the company's stand, together with the Rex dispenser, an appliance that provides an economic and uncontaminated supply of Rozalex to the worker when required.

BOXES AND CARTONS

The stand of Hunt Partners displays their comprehensive range of boxes and cartons, and special attention is drawn to the up-to-date methods by which boxes, both printed and unprinted, are produced.

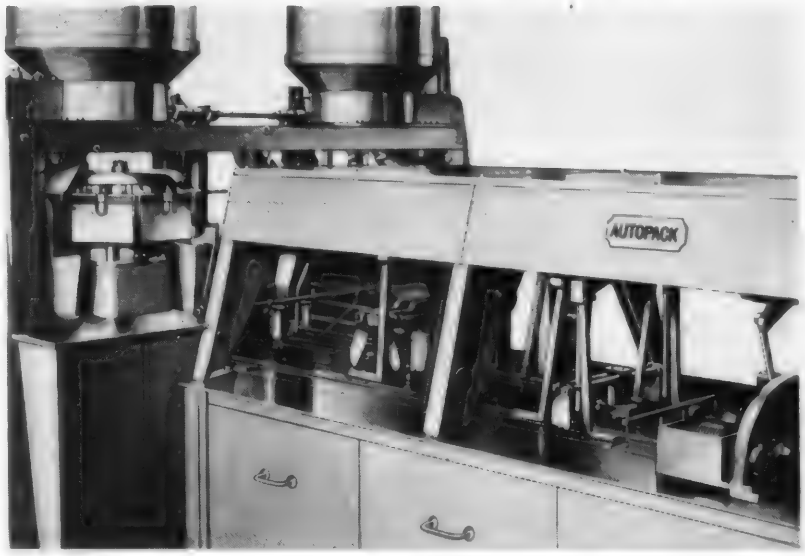
For long runs of printed cartons, the company's Velvetone process is of particular interest, and many examples of such packaging are on view. Produced at competitive prices, these cartons are well printed and accurately made, an essential where machine packing is concerned.

There is also a section devoted to visual packaging, with special reference to Phantox moulded acetate packs.

CARTONING PLANT

A newly developed automatic cartoning plant which feeds a gusseted type of bag from a magazine, fills it with 16 oz. of powder from a special type of automatic weighing machine, and discharges the bag into a carton which is then folded, gummed, and sealed, is one of the large range of machines exhibited by the Automatic Weighing and Packing Machine Co.

Other items of interest are ampoule and vial handling machines, a patent slide feed type filling machine used for peas, beans, and any other free-flowing materials, an automatic salt twist wrapping machine, an Autopacker for filling and sealing envelopes of powders, and a weighing machine to handle all varieties of sweets, both wrapped and unwrapped. The precision automatic weighing machines on view include a shuffle type for handling breakfast cereals, dried fruit, and any of the larger materials that have to be handled without breakage.



Automatic cartoning plant.
Automatic Weighing and Packing Machine Co.

CONVEYING EQUIPMENT

Particularly suitable for food manufacturing applications because of their flexibility in congested layouts are the conveyor equipment and remote controls exhibited by Teleflex Products. Featuring a roller-chain running within a unit-construction track of rigid jig-welded sections, the conveyors can be used with flat platforms, pin attachments for normal overhead conveying, retractable dog attachments for "creepers," or with scraper or bar attachments.

An interesting installation is that in a cold store in the Eldorado Ice Cream Co.'s factory. Cans and other containers are loaded to the conveyor in various workrooms and transferred on the Teleflex equipment to a convenient unloading position in the cold store.

An instance of the use of this equipment in utilising free storage space over machinery is provided in the works of the Britannia Folding Box Co., where maturing paper is suspended from a conveyor in readiness for pressing next day.

Cans and other containers are conveyed to the cold store in the Eldorado Ice Cream Company's factory.
Teleflex Products.

Semi-automatic labelling machine. *D. Trapow and Co.*

GUMMING AND LABELLING

A recent model of the semi-automatic type of labelling machine which will gum labels on both sides and affix them to any shape of bottle, jar, carton, or other container with an output of up to 200 dozen labellings per hour can be seen among the exhibits of D. Trapow and Co. A coding device, which will print up to six letters or numerals on the back, in the middle of the label which is not gummed, can be fitted to the machine.

Where it is necessary completely to gum a label, the Newman complete gumming labelling machine is available, and for affixing labels, either partially, completely, or overlapping, to small cylindrical objects such as tubes or small bottles, the company make a fully automatic machine. A new model of their strip gumming machine is also on view.

METAL CONTAINERS AND CLOSURES

A wide range of metal containers and closures for liquids, semi-liquids, powders, and solids is displayed on the stand of Reads Limited; where special internal treatment is necessary, lacquers and coatings are supplied by the company. For bulk packing there are steel, tinplate, aluminium, and other forms of drums or kegs in capacities ranging from 14 lb. to 4 cwt., or from 1 to 50 gallons.

Their associates, ViseGrip Products, are introducing their drum closure, which comprises a flange or screw socket which is inserted in the drum body or head, a screw bung, and a gasket to prevent leakage. In addition, a capseal can be affixed over the bung when it has been screwed tightly into the flange. The essential feature of the closure is that the screw sealing-plug with gasket and the flange clamp the drum metal between; as the plug is tightened, it grips the drum metal and cannot be overtightened, nor can the flange revolve. In operation there is only one single seal directly on to the container steel.

The world wide packaging service which the company offers to its customers is demonstrated at the Metal Box stand, where some recently introduced packages, including the finger-tip dispenser, the composite containers for oils, the Selex cap liner which is suitable for an unusually wide range of products, the string opening composite, and highly decorated boxes for the export market, are being featured.

New decorated container for the American market. *The Metal Box Co.*

PACKAGING ADHESIVES

A complete range of their adhesives (vegetable, animal, and synthetic) for the package maker and user is displayed by National Adhesives.

A variety of packs on which their adhesives are used is on show, special attention being given to the newer packaging materials and the exacting requirements of export packs.

Adhesives for every packaging purpose and for either machine or hand operations are on view at the stand of Gloy and Empire Adhesives. Technical representatives of both firms are in constant attendance at their respective stands to discuss consumers' adhesive problems.

PACKAGING FILM

Most of the latest examples of Pliofilm packaging, both for the home and export markets, are to be seen on the Goodyear stand. Sliced bacon attractively packaged in multi-colour printed airtight packs, coffee packed in Pliofilm-lined Flav-O-Tainer bags which preserve the freshly roasted aroma for many weeks, soup powders, dried apricots, potato chips, and rind-free cheese all packaged in the film, show the potentialities of this material in the food packaging field. Fruit drinks are "bottled" in liquid-proof sacs, and chocolates are being exported, packaged in the film laminated with aluminium foil and brown paper to provide a heat- and moisture-proof wrapper.

As the material is air-vapour-liquid-proof, foods of different flavours can be packed in the same tin, and sausages in brine can be kept separate from the accompanying full-flavoured sauce, which is contained in an envelope of the film.

SACKS AND SACK SEALERS

A representative range of the many types of their multi-wall sacks, including the Sealdsac, awarded the certificate of the Institute of Hygiene, is displayed by Medway Paper Sacks.

The three Sac-Sealer models shown are simple in design, economical in installation and operation, and capable of dealing with practically any type of product. A unique system of unitised components enables a wide range of models to be built up from the basic machine, even subsequent to installation.

The Sac-Sealer which seals up to fifteen sacks per minute. *Medway Paper Sacks.*

SCREW CAP CLOSURES

The R.O. method of sealing for screw top bottles or jars is being demonstrated on the stand of Metal Closures. These seals are supplied either with beaded skirt or with a pilferproof, perforated security band at the base of the skirt. All are made from aluminium, externally finished to suit requirements, coated internally for product protection, and lined with a sealing medium suitable for the contents and packing conditions.

The company are also showing their range of sealing machines for hand, semi-automatic, or fully automatic operation, including models for vacuum sealing, the R.O. seal being the only form of screw cap closure which can be applied under vacuum.

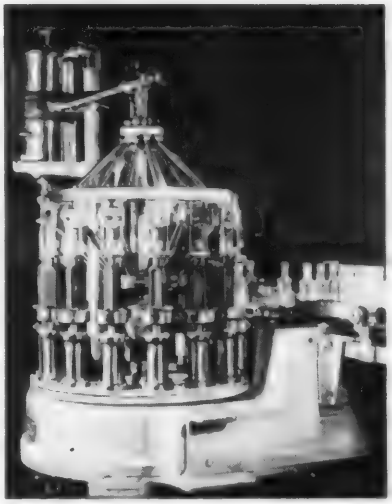
SEALING MACHINES AND TAPES

Two new automatic machines, a sealing and tabbing machine, and a package taping machine, are shown by Gordon and Gotch in collaboration with Adhesive Tapes, makers of Sellotape. The taping machine applies an embellishing seal to drop-lid containers of all dimensions and forms, and also tabs the end of the seal to facilitate easy opening. It seals at an average rate of 40 tins per minute and can be adapted to fit into a conveyor belt system.

As well as the colourless transparent self-adhesive tapes in general use, the newest opaque kinds in bright colours and pastel shades are featured at the stand of John Gosheron and Co. Printed tapes also have a special showing. Two waterproof tapes to be seen are Aqua-Nil, a repellent against water, oil, and even acids, and Transethyl, which possesses all the former tape's protective characteristics with the extra advantage of being flexile and therefore ensuring a thoroughly airtight closure. All three kinds are excellent for protecting labels. Specially bonded to give greater holding power, standard Transotape is the same material successfully used in the whaling expeditions for sealing tins of liver extract processed on the factory ship *Balaena* in Antarctic waters.

WEIGHING AND FILLING

Two new Hy-tra-lec machines—an automatic weighing and filling machine and a check weigher—are being exhibited by Industrial Products (Speco). These were first shown in May last year, but extensive development has been undertaken since then.



Filling machine for sauces and similar products.
Albro Fillers and Engineering Co.

Designed accurately to weigh and fill into containers pre-set net weights of from 4 oz. to 16 oz., the weighing and filling machine handles wrapped sweets, shelled and unshelled nuts, biscuits of regular sizes, and similar products, with a total output of up to 20 lb. per minute for 1 lb. discharges. Also shown is a two-unit installation of another model of this machine.

The check weigher demonstrated gives an indication of the machine's possibilities; it is available for two weight ranges—½ oz. to 4 oz. and 4 oz. to 1 lb., and will check automatically the unit weights of products and reject those underweight or overweight.

The weighing element of all these machines can be incorporated into other existing machinery.

A large range of filling machines, including a 15-head low vacuum type fully automatic machine, and a 9-head hand-fed rotary filling machine are being shown by Albro Fillers and Engineering Co.

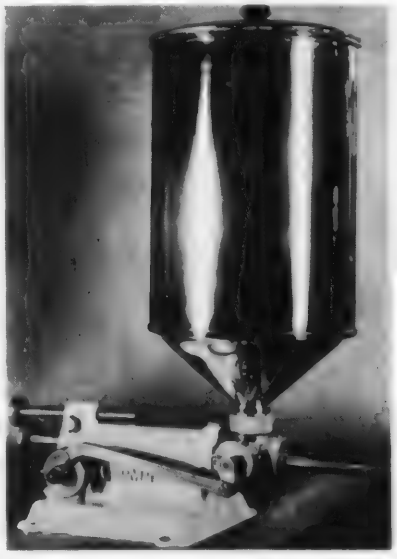
Semi-automatic vacuum operated fillers of the 4-head and 2-head types, single head Major and Junior filling machines of the vacuum type, a heavy products filler for pickles, yeast extract, and similar products, together with single and double head vacuum operated powder fillers and a combined conveyor and lid and stoppering machine, are also on view.

All the above exhibits are being shown at the National Packaging Exhibition held at Olympia from January 30 to February 9.

Packaging Plant and News

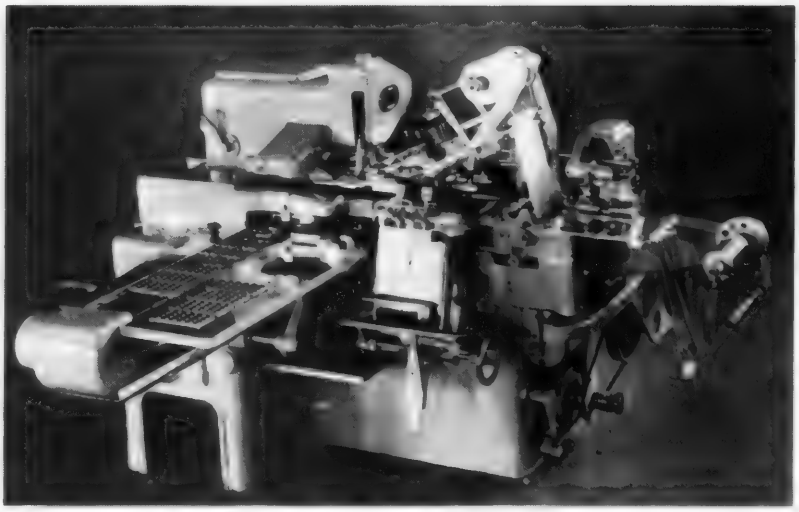
Collapsible Tube Equipment

With operations controlled by light-acting spring-loaded pedals, the tube filling, closing, and crimping unit manufactured by Universal Metal Products comprises a battery of three machines for arrangement in sequence on any convenient table. Filling is easy and accurate, whether semi-solids or creams are being handled, and a metering device forms a positive stop for the piston and regulates the quantity of the product being filled. Standard nozzles which are easily interchangeable are supplied for filling tubes, tins, or jars.



The tube rest of the closing machine is adjustable for various diameters of tubes and a stop is provided to adjust width of fold, while on the crimping machine a positive stop is fitted to enable different thicknesses of tubes to be crimped without fear of cutting.

The company manufacture collapsible tubes from tin, lead, and aluminium, treated where necessary with special internal lacquers to prevent reaction between the metal and the contents of the tube. These are being used increasingly for the packaging of such foods as mustard, pastes, jams, and meat extracts, and it is expected that both cream and condensed milk will soon be packed in this way.



Chocolate wrapping machine with an output of five tons of wrapped 4 oz. tablets in an eight-hour day.

High-speed Wrapping Machines

A single-stage machine which produces the classic type of chocolate wrap with envelope fold consisting of aluminium foil, inner paper, and label, and is capable of an output of some 5 tons of wrapped 4 oz. tablets in an 8-hour day, has been designed by SIG wrapping machines. It is adjustable within wide limits and operation pauses for replenishment are largely eliminated.

Instead of the conventional leather belt, the machine is provided with a washable, stainless, and durable slatted chain. The tablets are self-aligning, and the feed pusher operates only when the tablets reach their correct position. The folding section does not run faster, despite its high output, than constructions of smaller performance. The counterpart to the plunger, on its backward movement, circumvents the tablet in process of folding, and the resulting gain in time benefits the folding section. Horizontal staggering has been adopted by means of which the tablets leave the machine standing on a longitudinal edge, held by soft guide brushes, so that removal is quick and easy.

An important advantage is the facility of changing over the machine to economy-fold in which the envelope style is adhered to, but the foil wrap is placed in angular position.

Other recent models are a fast two-stage machine for wrapping chocolate tablets and an automatic packaging plant designed for the filling of cocoa powder and similar products.

Packaging Education

In view of the success of the first educational course of junior executives held in November, the Institute of Packaging have decided to run a further course on March 12-16 inclusive, at Shell Mex House, Strand, London, W.C.2, as before. The last date for submitting completed applications is February 12; forms are obtainable from the Secretary, Institute of Packaging, 55-61 Moorgate, London, E.C.2. (Tel.: Monarch 6226).

Waste-paper baling press.

Packaging and Sausages

Air-proof, moisture-proof, and fly-proof, Hypack, a transparent plastic food container, formed one of three interesting exhibits of the Oppenheimer Casing Co. (U.K.) at the recent Smithfield Show. Made of polythene, the containers are heat sealed and vacuumised so as to preserve the freshness of the food for longer periods.

A pork sausage, wearing in addition to its usual coat of hog and sheep gut a gaily painted transparent plastic wrapper, set the 1951 fashion for sausages, while the third item of interest was a 130-year-old oak-built English sausage machine, which is still capable of service.

Packed meal carton provided by Refreshment Room Service of the Hotel Executive.

Waste-paper Baling Press

Designed to meet the demand for an inexpensive, strongly made press suitable for the average business, the waste paper baling press manufactured by the Tyne Truck and Trolley Co. saves storage space usually required for waste materials, eliminates the use of sacks, reduces the danger of fire, facilitates the easy disposal of waste paper, and increases its value for sale to merchants.

The box is filled with waste material which is pressed down by means of a rack and pinion operated by a five-pronged handwheel, with a tubular extension for applying additional end-pressure. Bundling wire can be threaded through special grooves provided on the back and bottom of the box and on the pressing-plate, and the wired bale can then be removed, ready for sale.

The press can be used for wood shavings, hay, straw, moss, and similar material in addition to paper.

Fig. 1.

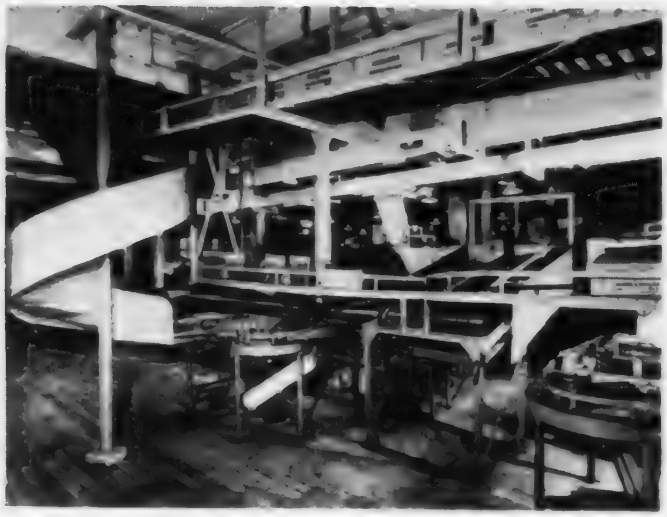


Fig. 2.

New System of Bottle Packing

A new system of bottle packing introduced by Horlicks in their Slough factory, depends largely on the installation of conveyor equipment manufactured by the British Wedge Wire Co. On arrival at the factory, cartons of empty bottles are placed on a long inclined slat conveyor which carries them up to the first floor storage space (Fig. 1).

When required, the cartons are put on gravity chutes (Fig. 2) which spiral down to the filling room, where cartons and bottles temporarily part company. The empty cartons are put on the lower end of a hump-backed woven wire belt conveyor (Fig 3), which is inclined almost up to ceiling level, and taken across the top of the packing room to deliver the boxes *via* further gravity roller conveyors to the end of the assembly line (Fig 4). After filling, capping, and labelling, the bottles are put into empty cartons which are sealed and delivered to the packed stock store by straight chutes and gravity conveyors (Fig. 5).

Fig. 3.

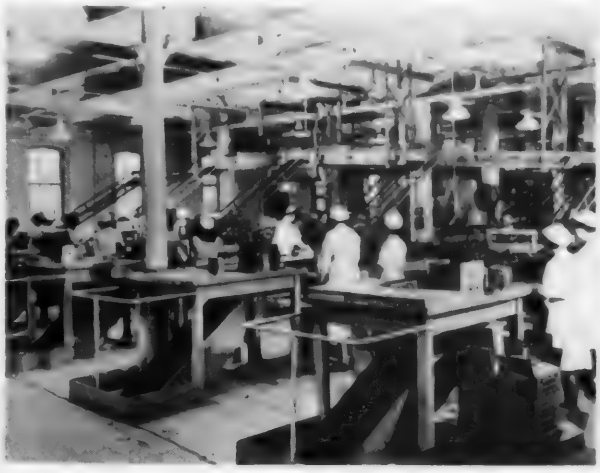
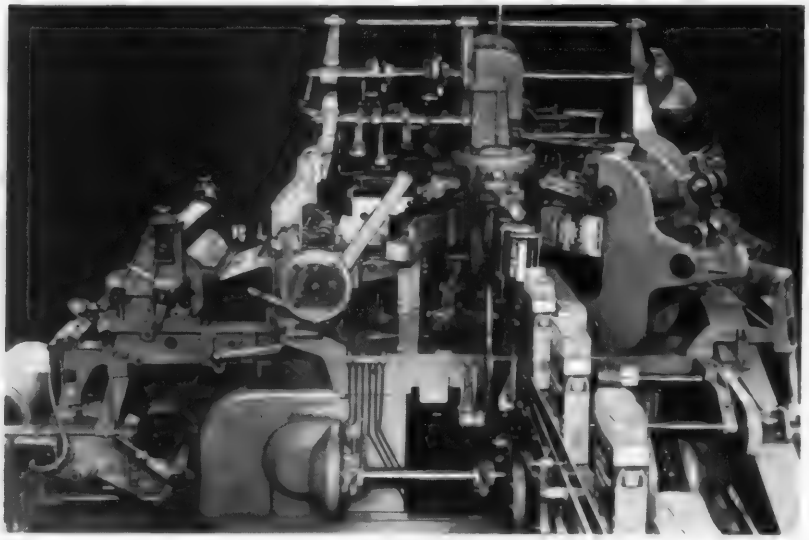


Fig. 4.

Fig. 5.



The double package maker for products requiring maximum protection from moisture.

Double Package Maker

A large model which completes the size range of their double package makers and has the same principle of operation as their small and medium machines has been developed by the Pneumatic Scale Corporation. The packages made by this machine at a rate of 65 to 70 per minute are particularly suitable for products requiring maximum protection from moisture.

Lining material is fed from a roll and formed around a block to make a bag lining; the block is then indexed and a carton blank is folded over the inner bag to produce a "double package," all in one operation.

One major change in the new machine is the operation of the side seam folders for both the liner and the carton. Previously, the folding mechanism was motivated from the main cam shaft below the platen through long connecting rods and levers; on the large unit, folders are controlled by individual cams above the spider and blocks.

Paper Containers for Foodstuffs

Ideal for packing such foodstuffs as chocolate spread, glacé cherries, ground almonds, cut peel, honey, potted shrimps, and synthetic cream, the waxed paper containers made by Mono Containers are supplied with either disc lids or screw caps. Sizes vary from 1 oz. to 80 oz. and any printing matter required can be incorporated on the body or lid of the container.

Paper containers are usually impregnated with paraffin wax to impart the required rigidity and sterility but a plastic proofing of the paper in place of wax is now available. The plastic finish gives a bright and glossy appearance to the container, thus enhancing its appearance and increasing its holding properties. This type of container is particularly suitable for the packing of fresh cream.

A subsidiary company, Perga Cartons, are in full production as manufacturers of waxed paper containers which are folded at the top and sealed by means of a metal clip. Made in 8 oz., 10 oz., and 20 oz. sizes, these are used chiefly for liquids or semi-solid commodities.

Standard for Cheese Wrapping

Specifying the total impurities permissible, the mechanical properties of the coated foil, the protective efficacy of the lacquer coating, and the approved gauges and limits of permissible perforation, B.S. 1683: 1950—coated aluminium foil for wrapping cheese—has recently been issued.

It should be understood that the use of aluminium foil which complies with this standard can produce satisfactory results only if the other conditions of packaging are also satisfactory, such as:

(*a*) The condition of the cheese, which should not contain an undue or unusual percentage of active agents such as to exclude it from the normal class of wrapped cheese.

(*b*) The viscosity of the cheese, which should be such that the cheese will fill the package with the minimum inclusion of air bubbles.

(*c*) The shape of the formed cup of foil, of which the edges and corners in particular shall conduce to its being completely filled.

(*d*) The avoidance at all times of undue stretching, scratching, and abrasion of the foil during manufacture, storage, and use; the correct clearance between die and plungers on the machine, to prevent undue squeezing of the folded foil, is particularly important.

(*e*) The composition of the boxes to contain the wrapped cheese. This should be as free as possible from substances likely to attack aluminium.

The fruit cake carton made for the Great Atlantic and Pacific Tea Co. by Robert Gair Co., Inc., won first place in the food class at the 1950 carton competition in Chicago.

How Food Machinery is Packed for Shipment

JOHN E. EVAN COOK, J.P.

Joint Managing Director, Evan Cook's Packers, and Chairman, Institute of Packaging

The ultimate aim of packing food machinery for export is to pack at the lowest economic cost, at the best possible freight rates, and to ensure delivery to overseas customers in as good a condition as when the machine left the end of the production line. Mechanical and corrosion damage are too often the result of conditions at this point of the procedure, and cannot be attributed to lack of care by those concerned with the actual packing for export markets. For this reason, the closest consultation is advocated between the export packer and the management departments of plant manufacturers before packing is put in hand.

THE SIZE of the packing case itself and almost invariably the cost of freight depends upon the size and shape of the machine to be packed.

As these factors also affect the complexity or otherwise of the internal packing and corrosion prevention, every food manufacturer is recommended to begin his packing in the drawing office where the machine itself was designed.

While obviously a machine must in the first place be fit for its purpose, there is no reason why that fitness should not also be seriously considered in relation to fitness for shipment—or "design for packability," as it might be called.

Difficulties in Packing

The bandsaw provides one such example. It is usually tall, narrow, with a heavy wheel at the top, and situated near the vertical centre of the machine is a table which is wider than the upright members. It creates many difficulties in packing. It demands a tall case, which results in a top-heavy pack and one that can easily be overturned, thus upsetting the centre of gravity for slinging purposes. This necessitates the construction of a case of disproportionate girth so as to accommodate the work-table; hence heavy freight charges have to be paid on shipping many cubic feet of air.

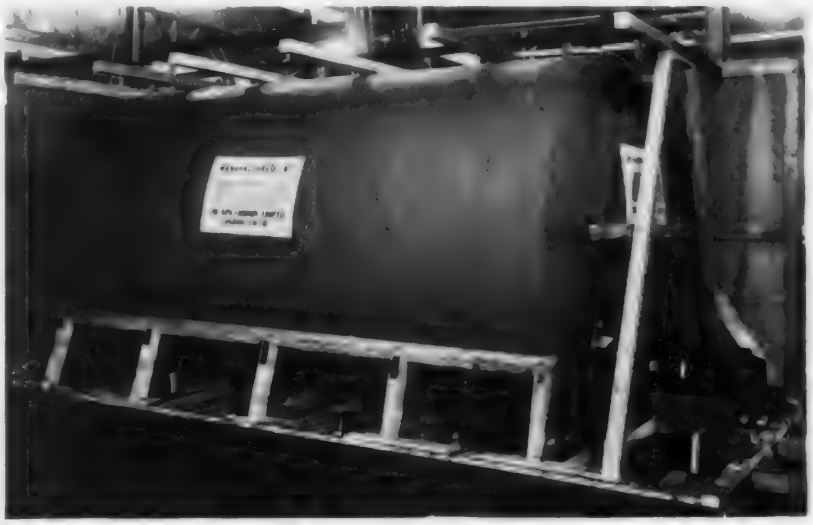
A remarkable economy in packing and shipping costs—and therefore a tremendous gain in price compared with competitors—awaits the firm that first produces a redesigned bandsaw with a top wheel and housing which can easily be dismantled and reassembled, and a detachable work-table; or, alternatively, a bandsaw which has no top-heavy wheel, but which is built upon horizontal instead of vertical principles.

Food and Bottling Machinery

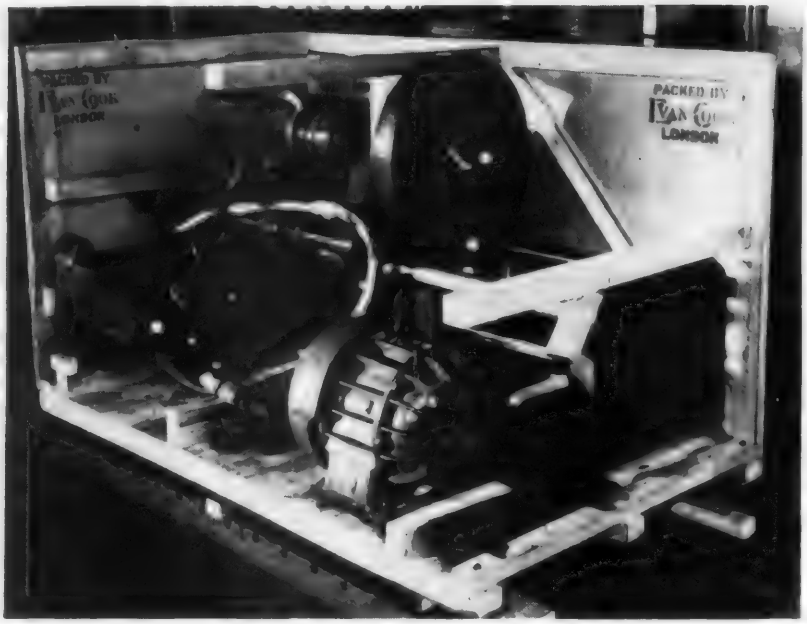
Food and bottling machinery which is designed to stand on one leg or centre pedestal presents further difficulties. Usually this pedestal supports a tank-like superstructure of sheet metal, and frequently is of less diameter than the structure it supports. This may be ideal for its purpose when bolted to the floor in a workshop, but the packer is faced with the difficult problem of bracing the sheet metal structure without causing it to take any strain or receive any of the inevitable shocks of transit liable to cause denting or the throwing out of alignment of the pedestal and structure.

There is also the machine, one of those tank-like affairs, standing squarely upon four legs which are firmly welded to the structure they support, and having no other function than to raise the working portions of the machine off the floor. The freight charges for such a machine are almost exactly twice what they would be were those legs screwed or bolted to the underside of the upper members. They could then be detached and packed inside the tank for shipment.

On many machines small or large gadgets, such as handles, wheels, fittings, and pipes, are attached outside the main contour of the machine. In some in-



3,000 gallon stainless steel vessel showing bracing.



Motorised industrial heavy mixing machine.

stances, the trouble is not very serious, because the projection is small, but it is serious when a complete electric motor is added to the outside of a machine. In many cases, these motors could be tucked under the legs.

Thermometer Mountings

One firm, producing a circular-shaped machine, with a shallow-domed top, supported on a single pedestal, also mounts centrally on top of the dome a thermometer standing 9 inches high. As it cannot be dismantled, the case must be made 9 inches taller, and its entire specification has to be changed to ensure strength on top to prevent crushing, caving in, or impact damage to the thermometer. This adds about 25 per cent. to the cost of packing and about 20 per cent. to the freight charges; the risk of damage by heavy articles dropping on top of the case from a height, or by being stood upside down, or crushed in slings and grabs is also greatly increased.

It is the task of managements to study their machines to see how design for packability can be applied to their products, and to assess the economics and the interrelationship of ease and cost of production and fitness for purpose with that of cost of packing, shipping, and extent of damage claims or merely overseas complaints. The latter may not involve a damage claim, but they do prejudice goodwill.

Steps can be taken during production and storage to safeguard against subsequent hidden corrosion. As can readily be appreciated, corrosion, especially in the humid atmospheres so frequently encountered overseas, is an ever-present bugbear, particularly for food manufacturers whose machines must ensure hygienic operation and ease of maintenance in this condition.

What is not entirely understood is that the deposition upon bright (usually precision) metal surfaces of atmospheric moisture-vapour is sufficient to cause later corrosion. If this is not thoroughly cleaned off immediately before packing, rust will develop, depending upon the humidity of the atmosphere through which it passes *en route* to the customer.

Wherever possible, therefore, rust-inhibitive oils should be used during the production process and coolants when machining. If precision parts have to be assembled, their surfaces should be scrupulously clean; and, if possible, a thin film of rust-inhibitive lubricant should be applied. It was the custom to advise manufacturers to mask such joints and precision surfaces (as when masking-off for spray painting), but this practice has been abandoned because it was found that moisture, which ultimately caused corrosion, was merely being sealed in.

If any part of the machine has to be given a paint finish, the most stringent precautions must be taken to ensure that the surfaces are clean before painting. Spraying or painting over dirt, grease, and other impurities does not prevent corrosion; it merely hides it until too late. The packer is unable to detect it, for he has no authority to remove all paint on the off-chance of finding dirt and or corrosion.

Because much food machinery is shipped clean, some thought should be given to the method of cleaning used before despatch to the packer. Even if the working surfaces are of stainless steel, or glass, the use of nothing more than a damp rag is not advisable. It is true that the customer will certainly clean down the plant again before use, but in the meantime corrosion will have been assisted.

Storage Methods

When the machine comes off the production line, if it must pass into store before packing (although packing first and then storage is advocated), the machine should be entirely covered with a clean damp-proof cover to keep out dust and atmospheric impurities, to prevent finger-prints from being implanted on metal surfaces (dust and finger-prints are astonishingly corrosive), and also to keep out drips of rainwater from a leaky roof.

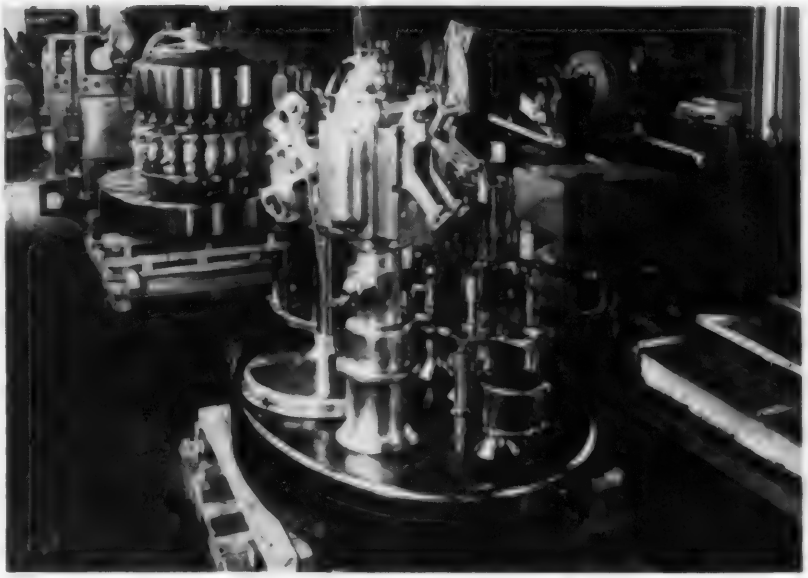
The storage place should be dry and well ventilated. Draughts of damp air, damp floors and walls, and high humidity conditions (*e.g.* in close proximity to any sort of steam-producing plant or process) should be avoided. Where possible, the machines should be placed on skids or pallets to check rising damp.

When plant is transported to the packer, it is essential to keep the machine under cover on the journey, no matter how short; damage done to an inadequately

covered machine is impossible to eradicate without completely dismantling.

The all-important difference between the packing of food and other machinery is the preservation of metal surfaces. With machine tools this is relatively simple. For instance, they may be treated with suitable types of corrosion preventive compounds. This is only partly feasible for food machinery where the external, or other surfaces which do not come in contact with food, can be so treated; but it is most advisable to avoid the direct application of preservatives inside tanks. In consequence, other preventive measures have to be taken, such as the sealing of corrosive surfaces and the exclusion of moisture and moisture-vapour from them.

This is by no means easy when the machine has to travel through the tropics, where condensation is bound to occur.

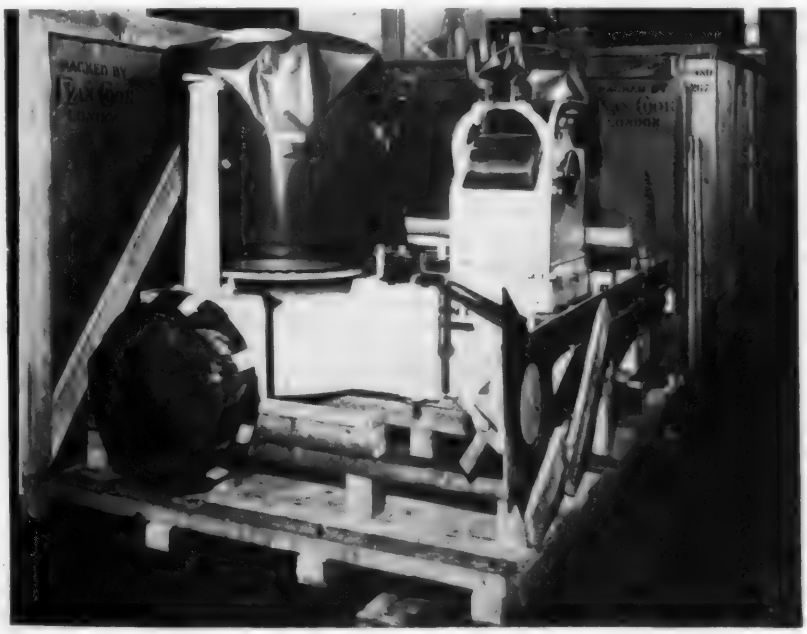


Graham-Enock filling and capping machines on the packing line.

Prevention of Corrosion

Constant research and investigation is necessary to keep abreast of corrosion prevention developments. Methods which before the war were thought adequate have been proved useless; and even in post-war years export packers have twice had to abandon widely accepted methods to secure that fractional improvement which makes all the difference. In the same period, many preservatives and methods which failed to survive preliminary tests have had to be rejected. No corrosion prevention method is perfect, and it may be that the root cause is the impossibility of securing absolute cleanliness, in practical commercial conditions, before the treatment is applied.

One great contributory factor affecting corrosion is the type of internal packing, dunnage, cushioning, and so on, which may have to be used to prevent damage to the machine itself. At one time extensive use was made of straw, flax rug, wood wool, sawdust, and shredded paper.



U.D. Engineering Co. bottle filler and capper.

Internal Packing

Experience has shown that the maintenance of a clean interior, and resort to more scientific methods of anchorage and strategic location of cushioning, are infinitely superior. Air in contact with metal surfaces, once humid, may tend to create corrosion. Air will, however, dry out, whereas most forms of stuffing harbour moisture for long periods and maintain it in contact with the product. If it must be used, then such dunnage must be kept away from contact with the product, or a moistureproof shield should be interposed. Even for relatively small areas of contact, say, between a felt pad and a metal surface, it is advisable to create a barrier against the direct transmission of moisture.

Methods of case construction and anchorage of the product inside the case are legion. Reports from overseas and from underwriters, however, suggest that considerable progress needs to be made in both directions in the majority of export packing cases

for all types of plant. This is a nation-wide need and does not apply to Britain alone.

The lessons learned during the war have not generally been adopted by industry. Such lessons have not been kept a closely guarded secret, except to those who for some reason have not bothered to keep themselves up to date. This is very apt to occur in a packing shop attached to one factory monotonously turning out a successful machine, where a pack devised years ago may be regarded as adequate for most purposes. Unless he is very alive and energetic, the foreman packer can get into a rut and be oblivious of developments in the world outside. He may be too busy or too far away from sources of information to keep himself up to date.

When sheer force of competition compels an expert packer to keep abreast of things, the factory packing department will not feel the impact so greatly.

For this reason, it is advisable that the management should take an interest, and should encourage executives and key personnel to take a similar interest in all the means of acquiring new knowledge, of which the Institute of Packaging may be taken as one example, and the trade Press another.

Skids and Slinging Irons

It has been demonstrated that shipping companies do not like crates or plywood-sheathed cases, and overseas conditions often result in damage to items packed in externally battened cases. In every instance, skids are of assistance, slinging irons are ideal if economically possible, slinging points should be marked, and scientific nailing procedures should be followed (see B.S.I. Packaging Code).

More important is the firm anchorage of the product inside the case. Bolting to the base, where possible, is ideal. Top and bottom cradling is an alternative, and nothing in the case, or on the product, should be capable of movement. An electric motor may be firmly enough secured to the machine for functional purposes, but unless it is secured additionally for shipment it is quite likely that shocks, jars, and vibration will break down its moorings. It is imperative that a case should be so constructed that at no time can a shock or jar from outside be transmitted directly to the product. Through - and - through members are the solution. Similarly anti-crush bars should be fitted to prevent sling and grab squeeze damage.

There has also been a quite noticeable increase in rejections by port and shipping authorities. These concern export packs which have failed to reach the docks in good condition. In most instances the wrong thickness of board has been used, second-hand materials have been badly applied, nailing has been inadequate or wrong (*i.e.* solely through the end grain), or the principles of strutting and bracing have not been followed internally. It is almost always a matter of providing a new case; very seldom one of repairs.

Repacking is a serious matter for the nation, and managements are urged to keep this aspect constantly under review.

The methods described are those which have been tried and found successful by export packers, who handle all types of machinery for shipment. At meetings of the Institute of Packaging positive proof has been given of the destruction and damage which do occur to export consignments.

Greetings Acknowledgments

FOOD MANUFACTURE acknowledges with thanks cards, calendars, etc., received from the following: Barnett Trading Co.; Walter Pearce and Co.; Albright and Wilson; Batchelor's Peas; Henri Cheftel (J. J. Carnaud Forges de Basse-Indre, France); James Grew and Co. (Ireland); The Metal Box Company; New Hall Pottery; Procea Products; T. Wall and Sons; Sildolje og Sildemelindustriens Forskningsinstitutt (Norway); Monsanto Chemicals; Nadre Jamar Publications; Polak and Schwarz; Jack Olding and Co.; J. A. Radley; Verity Press Features; G. and W. Industries (Johannesburg); Courtaulds; W. J. Bush and Co.; Aveling-Barford; Norman Evans and Rais; Hotel Royal Splendide (Aix-les-Bains); Samuel Jones and Co.; New Holland Machine Co. (U.S.A.); Eburite Corrugated Containers; Geo. Cohen, Sons and Co.; P. and I. Danischewsky; Practical Etching Service; Sondes Place Research Institute; Pearlite Box Company; J. Valentine Backes (Ch. Goldrei, Foucard and Son); Firmenich and Co. (Geneva); Evans Chemicals; British Vacuum Cleaner and Engineering Co.; Batchelor and Co. (Ireland); W. H. Gollings; Thos. Hedley and Co.; Reads; Wightman and Co.; I.C.I.; Philip Henderson and Co.; Johnson, Matthey and Co.; Pritchard Wood and Partners; De Westhoek (Holland); Mono Pumps; Richard Lonsdale-Hands; Lane Wells Co.; Colonial Development Corporation; F. J. Edwards; Boxfoldia; Block and Anderson; D. P. Hopkins; Chance Bros.; Dr. L. V. Burton; C. W. Field; Lintas; Marshall, Sons and Co.; Winguard; Rawlinson Broughton; Blaw Knox; Gillman and Spencer; Thos. Broadbent; Shell Chemicals; Basil Butler Co.; Harold Morgan; Foote Cone and Belding; "Reader" Romano (Istanbul); Lintafelt; Manufacturers' Agencies (N.Z.); Fibreglass; Glaxo Laboratories; Bolijn (Holland); Cinema - Television; Fina Petroleum Products; British Tabulating Machine Co.; Frederick Elias and Co. (Cairo); The Oppenheimer Casing Co. (U.K.); Date Association of Iraq; Fructexport (Bucharest); S.A. Fruits Vitrac (France); Geo. W. Rhodes and Son; Spicers; Vera Seymour; Process Blocks; American Society of Bakery Engineers; Selwyn Press; N.I.A.E.; Ortho Pharmaceuticals; J. R. Burrell; F.M.S. Co.; Rose Bros. (Gainsborough); Kenya Sugar (Mombasa); N. A. Remtula (Tabora, E. Africa); Spanish Economic News Service (Madrid).

News from the Industry

FORTHCOMING EVENTS

S.C.I. Annual Meeting

The seventieth annual general meeting of the Society of Chemical Industry is to be held in London from July 9 to 13, 1951, centred in the buildings of the Imperial College of Science and Technology, South Kensington.

Already some 1,300 scientists and their guests, many from the provinces, the Empire, and other countries of the world, have expressed their desire to attend the meeting.

The organisation of the meeting is in the hands of the London Section, under the chairmanship of Dr. A. C. Monkhouse, of the Fuel Research Station, with Mr. E. L. Streatfield, F.R.I.C., as the hon. secretary. A full programme of lectures on the principal theme "Water in Industry" is being arranged. In addition, many visits to places of interest in and around London and to factories and laboratories are being organised, while a list of luncheons, dinners, and receptions is being considered.

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Institution of Works Managers

February meetings of the Institution of Works Managers are as follows:

Feb. 1. *Bristol Branch.* "Foremanship," 7.15 p.m. at the Royal Hotel.

Feb. 2. *Notts and Derby Branch.* "Why Nationalised Industry cannot be Efficient," L. C. Ord (Lewis Ord and Partners). 7.30 p.m. at the Mechanics Institute, Nottingham.

Feb. 3. *Sheffield Branch.* Discussion (jointly with local Study Group). 3 p.m. at the Grand Hotel.

Feb. 6. *Leicester Branch.* "Designing for Standardisation and Production," J. E. Chadbund (Brush Electrical Engineering Co.). 7 p.m. at the College of Technology.

Feb. 6. *Merseyside Branch.* "Personnel Problems of a Works Manager," A. Scholes (British Enka). 6.30 p.m. at the Adelphi Hotel, Liverpool.

Feb. 8. *Wembley Sub-branch.* "The Study of the Mind," I. H. Child (B.T.H. Co.). 12.30 p.m. at the Plough, Kenton.

Feb. 8. *Tees-side Branch.* "Some Aspects of Operator Training," E. F. L. Brech (Urwick, Orr and Partners). 7.30 p.m. at the Vane Arms Hotel, Stockton.

Feb. 9. *Manchester Branch.* "Industrial Law," L. Walsh, barrister-at-law. 6.30 p.m. at the Grand Hotel.

Feb. 13. *Preston Group.* "Good Housekeeping," Miss N. L. Forster, H.M. District Inspector of Factories. 7 p.m. at Starkie House.

Feb. 13. *West Midland Branch.* "The Work of the West Midland Joint Electricity Board," W. Lewis, O.B.E. (West Midland Joint Electricity Board). 7 p.m. at the Grand Hotel, Birmingham.

Feb. 14. *Merseyside Branch.* "The Measurement of Productive Efficiency," W. C. Puckey (Hoover, Ltd.) (jointly with the Institute of Cost and Works Accountants and Institution of Production Engineers). 6.30 p.m. at Radiant House, Liverpool.

Feb. 26. *Glasgow Branch.* "Producing what we can Sell—Selling what we can Produce" (jointly with Incorporated Sales Managers' Association). 7.15 p.m. at the Institution of Engineers.

The third residential national conference of the Institution will be held at Southport from April 13 to 15, 1951. The previous two conferences have been organised entirely by the headquarters of the Institution, but this one is being arranged largely by a local committee of members drawn from the Manchester and Merseyside branches.

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Royal Institute of Chemistry

The following meetings complete the present programme of the London and South-Eastern Counties Section of the Royal Institute of Chemistry:

Mar. 1. "Some Applications of Microbiology to Analytical Chemistry," S. Price, B.Sc. (with the London Section, Society of Chemical Industry). 7 p.m. at South-East Essex Technical College, Longbridge Road, Dagenham.

Mar. 2. "Rockets and Chemistry," J. G. A. Griffiths, B.A., Ph.D., F.R.I.C. (films and lecture). 7.30 p.m. at Woolwich Polytechnic, London, S.E.18.

Mar. 8. "Rockets and Chemistry," J. G. A. Griffiths, B.A., Ph.D., F.R.I.C. (films and lecture). 7 p.m. at West Ham Municipal College, Romford Road, London, E.15.

Mar. 13. Dance. 7 p.m. at Caxton Hall, London, S.W.1.

Mar. 19. "Some Experiences of a Chemist in the Museum Service," F. Greenaway, M.A., F.R.I.C. 7.30 p.m. at the Bull Hotel, Dartford.

Mar. 20. "Recent Advances in Chemotherapy of Tuberculosis," D. E. Seymour, F.R.I.C. (with the Welwyn Garden City Scientists' Club). 8 p.m. at the Cherry Tree, Welwyn Garden City.

Mar. 21. "Some Fundamental Problems of Analytical Chemistry," H. N. M. H. Irving, M.A., D.Phil., L.R.A.M., F.R.I.C. (with the London Section, British Association of Chemists). 6.30 p.m. at the Waldorf Hotel, Aldwych, London, W.C.2.

Apr. 2, 3. Symposium on "Applications of Colloid Science to Industry" (with the London Section, Society of Chemical Industry). Further details to be announced.

Apr. 5. "Recent Trends in Fuel Research," A. C. Monkhouse, B.Sc., Ph.D., M.Inst.Gas E., F.R.I.C. 7.30 p.m. at the King's Fare Restaurant, King Street, Luton.

Apr. 23. "Modern Chemotherapy," M. A. Phillips, D.Sc., A.M.I.Chem.E., F.R.I.C. 7.30 p.m. at the Sun Hotel, Chatham.

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Good Housekeeping Week

The Royal Society for the Prevention of Accidents is furthering the aims of the Festival of Britain by organising a national "Good Housekeeping" week for British industry from April 2 to 7, 1951.

The idea of the scheme is firstly to enlist the support of all employers and employees in securing tidiness and cleanliness in the workshop, for experience shows that they are invaluable factors in reducing accidents. Results thus achieved also increase productivity, eliminate waste, and help in salvaging scrap material.

Secondly, it is to provide an opportunity for a general spring cleaning of British factories in readiness for the Festival.

A programme of suggested activities is being drawn up and the Society is preparing special publicity material, including a booklet for distribution to factory workers. The Society's Industrial Accident Prevention Groups are helping in the local work of organisation.

The Society is seeking the support of every local authority, Chamber of Commerce, and Junior Chamber of Commerce in Great Britain in making the Good Housekeeping week a notable national drive.

Educating the Consumer

The exchange of viewpoints between consumers and manufacturers is being facilitated by talks on the growth and scope of canning and the development of quick freezing being given by representatives of Smedley's to various consumer groups.

Canada Market Digest

A recent Canada Market Digest, prepared by the United Kingdom Trade Commissioner Service in Canada, and issued by the Commercial Relations and Exports Department of the Board of Trade, is devoted to refrigeration condensing units.

The Digest, which covers aspects such as import restrictions, Government regulations and standards, extent of market, and sources of supply, sets out the competitive disadvantages of United Kingdom units. British refrigeration condensing units are said to be almost completely unknown in this market and it is important that the Canadian trade be kept fully informed of the latest developments in the United Kingdom industry.

A similar Digest, covering the same aspects with regard to bakery machinery, has also been issued. It is interesting to note from this report that there is no production of biscuit machinery in Canada, and U.K. manufacturers of this equipment are recommended to enquire into the possibilities of increased trade.

Industrial Estate for Scotland

One of the two new factories now being established at Greenock in the area formerly used as the Caird shipyard, is to be taken over by a well-known firm of boxmakers who handle a wide range of boxes of tin, wood, and board and who are urgently needing to expand production, largely for overseas trading.

The Board of Trade is creating an industrial estate in this area; demolition is now going on at the site, and the erection of two new factories, each 450 ft. long, will begin as soon as possible.

New Cider Mill at Hereford

The first stage in the construction of Bulmer's new cider mill at Hereford has been completed; one-third of the plant has already been in operation and has proved of great value in dealing with the large 1950 crop of cider fruit.

With a capacity of 1,000 apples a day, the new plant has been designed not only for the most efficient production of cider, but also to facilitate and speed up the reception of apples at the factory.

For speedy weighing of the incoming fruit, two of the latest type of recording weighbridges have been installed. The apples are discharged into reception canals from which they are conveyed by a constant stream of water to a screener of unique design, where they are washed and cleaned before grinding in the special type of mill. The ground apple is pumped through pipes to hoppers fitted with automatic dosers, which feed the material on to the hydraulic presses. These, made in England, although of Swiss design, give the pulp a long pressing and operate at a very high pressure, so as to produce a dry residual pomace from which pectin is later extracted.

Adjoining the new mill is a vat house containing concrete vats with a capacity of 600,000 gallons. This will be joined by a 500 yd. long pipe, passing under the roadway, to the vat storage at the main factory, where there is already the largest storage of cider in the world.

One of Bulmer's new cider presses.

Leonard Hill Social Club Ball

The second annual ball of the Leonard Hill Social Club was held on December 21 at Kensington Town Hall, when Mr. and Mrs. Leonard Hill and their two daughters, a large company of the staff, contributors to and advertisers in the journals of the House, and other friends spent a very pleasant evening.

Apart from the dancing to music provided by Bill Yates and his orchestra, there were a number of amusing competitions, and during the evening the gathering was honoured by a visit from the Mayor and Mayoress of Kensington.

Miss Carson and her committee must be congratulated on the success of this enjoyable function.

Mass Production in Bakery

The swing towards mass production bakery operation will be continued, according to Mr. James Lang, President of the United Co-operative Baking Society of Glasgow. Only such large-scale fully organised units can meet the fiercely competitive situation which has developed in the bakery industry.

Outlining the benefits of mass manufacturing when speaking at Galashiels recently, he said that bakers working in older plants required to allow an uncertain additional volume to compensate for accurate weight when baked. By machine manufacturing, precise weights could be worked out and the saving was considerable when a weekly bake of some 86,000 dozen loaves was involved.

Drastic fuel economies could also be achieved, and end loaves eliminated.

Dealing with the economics of large-scale baking, he pointed out that the U.C.B.S. figures on mass production methods showed a higher margin of profit to the extent of 2s. 6d. per sack over the average obtained by the industry in Scotland.

Progress is being made in Fife in the setting up of a new central bakery to service 18 Co-operatives in the area. No final date has yet been fixed for its operation, but plans are being made to form a local committee, representative of the Co-operatives involved, to manage the unit. The United Co-operative Baking Society, owners of the plant, are adopting this policy here, as in Belfast, in order to ensure continuity of operation, their own directors being part-time workers.

Food Preparing Machines

Equipped with a gearless hydraulic device, the Diana dicing machines, manufactured by Union Food Machinery and Equipment, cut fat and meat, whether raw, frozen, or cooked, and vegetables, fruit, and peels in uniform cubes, strips, or slices. Output varies from 8 to 80 cwt. according to size and the cubes vary from ½ in. to 1¾ in.

These, together with the Tiger mincer, which has two speeds and two cutting units for raw or cooked meat, and a bowl cutter with the speed of the bowl regulated by a patented variable gearless device, and motor with V-belt drive built in the cabinet, were shown by the firm at the recent Smithfield Show. A bowl cutter and mincer combined was also exhibited in various sizes. One of these models has a window in the hopper of the mincer to allow a view of the constant and automatic lubrication of all moving parts.

The company also manufacture power fillers operated by oil pressure and water or air pressure.

U.S. Market for Fish Products

A report on the market for fish and fish products, prepared by the Commercial Department, British Embassy, Washington, has been issued by the Commercial Relations and Exports Department of the Board of Trade.

This gives details of the extent of the market and nature of demand, packaging and grading, warehousing, how business is done, promotional activities, etc. The report concludes that a market definitely exists for United Kingdom fish in the U.S.A., but that the questions of continuity of supplies, uniformity of quality, and quotations will decide whether or not efforts on the part of U.K. exporters will be successful.

Birth

Heartiest congratulations to Mr. W. G. Norris, editor of our esteemed contemporary of the Leonard Hill group, MANUFACTURING CHEMIST, on the birth of a son on January 1.

Census of Production

DETAILS OF INFORMATION TO BE OBTAINED

The Census of Production (1951) (Scope, Returns, and Exempted Persons) Order, 1950, which operates as from December 30, 1950, and indicates the scope of the Census of Production to be taken this year in relation to the year 1950, has been made by the Board of Trade.

The scope of the Census to be taken in 1952 in respect of the year 1951 and the information to be obtained have now been settled after consultation with the newly appointed Advisory Committee, the membership of which is as follows:

Mr. J. Stafford (chairman); Professor G. C. Allen; Professor R. G. D. Allen, O.B.E.; Sir Wilfred Ayre, J.P.; Sir Leonard Browett, K.C.B., C.B.E.; Mr. S. P. Chambers; Mr. C. N. Gallie; Dr. C. Oswald George; Mr. W. A. B. Hopkin; Mr. L. A. W. Jenkins; Sir Norman V. Kipping, J.P.; Sir Ralph W. Lacey; Mr. Philip Lyle; Mr. T. A. Mitchell; Mr. W. E. Parker, C.B.E.; Mr. C. E. Prater; Mr. Kenneth Preston; and Mr. George Woodcock.

The joint secretaries of the Committee are Mr. H. E. Browning and Mr. S. J. C. Aikens at the Census of Production Office, Neville House, Page Street, London, S.W.1.

All establishments within the field of production will be included in the Census. The statutory form of return will include questions on (1) working proprietors; (2) employment; (3) wages and salaries, etc.; (4) plant, machinery, and vehicles; (5) new building work; (6) power equipment and fuel usage; (7) shift-working; (8) materials and fuel purchased; (9) work given out; (10) stocks at the beginning and end of the year; (11) output; and (12) transport payments. Questions on (1), (2), (3), (4), (5), (9), and (10) will be broadly as for 1949, except that no quarterly figures of wages but only the year's total will be required. There will be no analysis of sales section and no information will be required for 1951 about merchanted goods, which should, as in censuses before 1950, be excluded from all sections.

In the materials section, only one value figure, namely the total cost of materials and fuel purchased, will be required, as for 1949 and 1950; in addition, however, firms will be required to state the quantities used of a limited number of selected materials about which information is specially needed.

In the output section firms will be asked to show their sales of each of a number of products on the lines of the detailed form used for 1948. The lists of products have, however, been simplified and shortened as far as possible.

In future, firms will generally find it unnecessary to analyse their transport accounts in order to complete their returns; both the cost of materials and the value of sales will be asked for as invoiced, including transport inwards and outwards only where this is included in the invoiced price, except that sea freight should be included in the cost of materials but excluded from the value of sales, the line being drawn in each case at the port. The total amount paid for inland transport (*a*) to other firms or (*b*) to a firm's own separate transport organisation will be asked for.

Information about power equipment and fuel usage is to be collected for the first time since 1930 and will be of value in showing how far the use of power in industry has increased since that time and in making comparisons with other countries. In addition the results will be of special value for the study of productivity. In order to throw further light on this subject, a few questions will also be asked about shift-working, on the general lines of a similar enquiry made by the Ministry of Labour in 1935.

Detailed lists of the output headings to be specified for 1951 have been sent for comment to the trade associations concerned. Details of the Census forms to be used are being sent to trade associations early in 1951.

Change of Name

Mr. C. S. Jenks having joined the board of E. D. Brian, Limited, the name of the company has now been changed to Brian, Jenks and Co., Ltd.

Mr. Jenks has also joined the board of Eastern Counties Preserves (1940), Ltd., Long Sutton.

More Thanksgiving Gifts

Two more firms in the food industry—Davis Gelatine and George Borwick and Sons—have made donations of 10 guineas each to the Lord Mayor's National Thanksgiving Fund, which now stands at over £740,000.

Erections and Extensions

Plans have been prepared by Pearce, Duff and Co., baking powder manufacturers, for the erection of a new factory on a site bounded by Spa Road, Dockley Road, and Rouel Road, Bermondsey, S.E.16.

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Large-scale extensions to their factory at Waterden Road, London, E., at an estimated cost of £250,000, are planned by Clarke, Nicholls, and Coombes, confectionery manufacturers.

Employees Share Profits

An experimental profit-sharing scheme is being put into operation by Farmhouse Bakeries of Welshpool, Montgomeryshire. The scheme is based on a system of points which are awarded according to the length of service of the employee, the age, and the position held; if the scheme is continued in future years, allowances will also be made for regular attendance.

In describing the scheme, Mr. E. S. Wallbridge, managing director, said that it provided an ideal opportunity for the closer friendship of employer and employee and could be made to operate in both large and small concerns.

Accounting Office Aids

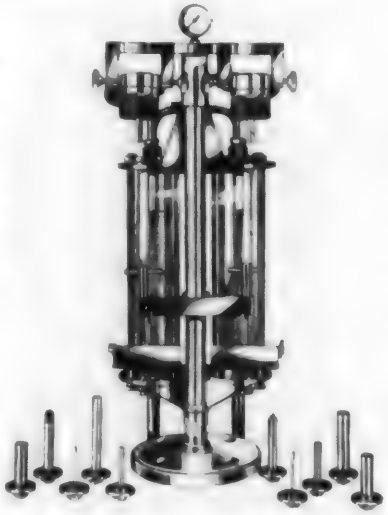
Incorporating several new features, including a device for ejecting the posted ledger cards vertically into a tray beside the operator and stacking them in their original order, an improved Banda "line-poster" is being marketed by Block and Anderson. To eliminate the possibility of the operator skipping an entry, the drum is designed to revolve only once at each depression of the treadle. Automatic damping will in future be a standard feature of the machine.

Also available is an adjustable mirror which, together with the printing line indicator, allows the reference number, account number, or name to be read straight from the master, thus dispensing with the need for a copy clipped to the master as a refence for posting.

The company are also marketing a completely new range of Brunsviga calculating machines; models are available in product capacities ranging from 18 to 20, the speed of working being considerably increased by single-hand operation and automatic transfer.

Vacuum Filling Machine

Working on the vacuum principle, Vacfill filling machines can handle efficiently a wide variety of liquids and semi-solids and may be operated by unskilled labour. Each container placed under the nozzle is rapidly filled to a predetermined height, accuracy in the required amount being obtained automatically by an initial adjustment. Any overflow is returned directly to the bulk container, thus eliminating loss or soiling of filled containers; leaky containers are rejected automatically before being filled.



Almost any size or shape of container, varying from small sprinkler-topped bottles to those of 1 gallon capacity, can be accommodated on the same machine. The new model embodies a special spring-loaded head suspension and improved nozzle construction to give a high rate of regular output.

Compact in design, the Vacfill, made by Busby, Winter and Co., can be positioned easily on existing filling tables, and a pliable hose allows filling direct from a bulk container.

Census of Distribution

An Order indicating the scope of the Census of Distribution to be taken in 1951 has been made by the Board of Trade. The Order indicates the activities in the field of distribution to which the Census relates, and gives a list of the other services which are within the scope of the Census.

The Order operates as from December 30, 1950, and is entitled the Census of Distribution (1951) (Scope, Returns, and Exempted Persons) Order, 1950.

Oatmeal Associations' Merger

Acting in the interests of the industry, the Scottish Oatmeal Millers' Association and the North of Scotland Oatmeal Millers' Association have agreed to a merger of the two bodies to form the Scottish Oatmeal Millers' Association with Mr. William Grant of Edinburgh as President and Mr. Arthur C. Gordon of Aberdeen as vice-president.

The move marks a stage in a plan to revive the fortunes of the oatmeal industry by greater concentration of effort and activity.

Scottish Preserving Project

A canning and bottling factory, estimated to cost £10,000, is to be built at Forfar. The factory, which will deal with fruit, vegetables, and jam, is to be opened by Eastern Counties (1940) Preserves, of Long Sutton, Spalding, Lincs. It will consist at first of a brick single-storey building, 390 ft. long by 80 ft. wide, so constructed as to be easily extended, and it is hoped that there will ultimately be buildings of similar dimensions.

It is hoped to start building early in the year and at least part of the factory will be ready to cope with the 1951 crop. At first the factory will deal with the bottling and canning of peas and vegetables, but will later undertake quick freezing and the manufacture of jam.

Christmas Trade Gathering

A party was held recently by S. Daniels and Company, well-known food importers and distributors, at which the directors, staff, and various friends in the trade, numbering about forty-five people, partook of a cold buffet lunch. This was followed by a general get-together during the afternoon when a large number of trade friends, who were unable to attend the lunch, called in to take the opportunity afforded of exchanging information and making themselves known to each other.

The gathering was most enjoyable and the contacts made could not have failed to be of mutual value to all who were present.

Soft Drinks Technology Course

The soft drinks technology course at the Aston Technical College, Birmingham, will consist of sixteen weekly two-hour lectures, and not six as mentioned in FOOD MANUFACTURE, December, 1950, p. 514.

1851—W. J. Bush and Co.—1951

A CENTURY OF PROGRESS

It was his early appreciation of the potential markets that led the 22-year-old W. J. Bush, in 1851, to set up in business in Bishopsgate, where he began the preparation of tinctures and extracts, the steam distillation of herbs, woods, and spices, and the production of other compounds.

Dr. P. C. C. Isherwood, chairman.

Eric L. Bush, director.

From the little shop in Bishopsgate, to premises in Artillery Lane, near Liverpool Street, to Ash Grove, Hackney, where a factory was built which has remained the headquarters of the company to the present day, and out to Mitcham, where, in 1886, Bush purchased the old-established firm of Potter and Moore—thus did the family business grow in the comparatively brief span of 85 years.

The founder died in 1889, and his legacy of planned and economic expansion was inherited by his eldest son, William Ernest, Baron de Bush, who had been successfully pioneering in Europe to make his father's House recognised as one of the most progressive chemical manufacturers of the Continent.

It was William Ernest who, in 1897, converted the partnership into a limited liability company, and who became its first chairman of directors. It was William Ernest who pointed the way to overseas interests with the establishment of factories and offices in Australia, South Africa, and America, while his brother, James Mortimer, was completing his plans to cover the enormous potential market in Russia. William Ernest's untimely death in a railway accident removed a brilliant leader.

James Mortimer, the second son of the founder, assumed the chairmanship, and proved an able successor to the Baron. The drive for new markets and new sources of supply went on.

1906 saw the acquisition of premises in Grasse for the treatment of the produce of the *Alpes Maritimes*.

1912 heralded yet another transatlantic tie when the Canadian company was established—a fortunate move for Bush because shortly afterwards, during World War I, the Russian factory was swallowed in the revolution of 1917.

During these early twentieth century years, James Mortimer had always advocated the employment of highly qualified specialists for each phase of the company's work. The first, and certainly the most notable, of these appointments took place in 1901, when Dr. P. C. C. Isherwood joined the rapidly growing business. It was an appointment at once fortunate and of great

A. J. McIntyre, director.

Cecil F. Bush, director.

moment to Bush—as subsequent years have indeed emphasised.

In complete unity and amity with the founder's descendants, Dr. Isherwood became more and more a part of Bush, until, in 1935, on the death of Alfred Walter Bush, he was made joint managing director, and in 1941, when James Mortimer passed away, he became chairman—both appointments being the result of supreme ability in the technical and marketing spheres.

During World War I, he pioneered and developed a factory in Widnes, and the Bush factories played an important part in supplying the needs of the Government for civil and military services. Continued emphasis on the policy of employment of specialists had equipped Bush with many skilled technicians and chemists. These were the men behind the improvisation which was necessary to meet the sudden increase of essential manufactures.

After World War I, as after World War II, Bush's first consideration was the consolidation of experience and technical advances to improve their service. On both occasions, the post-war years were not wasted, and many improvements have been effected in method and machinery for the manufacture of widely varied products, many of which Bush were largely instrumental in perfecting.

Today, in Australia, New Zealand, Canada, America, Europe, Bush maintain the same high standard that was set by the founder.

In commemoration of this notable milestone in the history of the company, W. J. Bush and Co. have issued a very handsome centenary album and diary which comprises a pictorial record of their worldwide development, establishments, and personalities.

A series of entertainments has already been offered by the company, an outstanding one being the luncheon to the technical press at Brown's Hotel on December 4, and the yearly buffet supper at the Palmerston Restaurant on December 20, which was followed by the performance of "Someone at the Door" by the firm's amateur dramatic society at the Cripplegate Institute.

During the year, Bush directors and selected staff will be "at home" to members of the relevant trades, in association with the various exhibitions to be held. At the moment the programme is as follows:

H. Brinsley Bush, managing director.

C. R. Woods, sales manager.

(*a*) Chemical and perfumery trades and proportion of food industries, at four evening receptions during the course of the B.I.F. in May.

(*b*) Bakery and confectionery trades, at two evening receptions during the course of the Exhibition in early October.

(*c*) Ice cream industry, at two evening receptions during the course of the Dairy Show in late October.

(*d*) A reception to be held in Scotland, possibly in association with the Scottish Dairy Show, in February.

BOOKLETS RECEIVED

Manufacturers of a wide range of crushing, grinding, and screening plant, Sturtevant Engineering Co. have recently issued a booklet which describes and illustrates the smaller types of such equipment specially built for laboratory work. Although mainly used in laboratory work, their construction is of such a substantial nature that they are suitable for continuous duty, and combinations of these machines are used to form pilot plants before full-scale installation is undertaken.

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Published for the information of users of stainless steel castings, a brochure produced by Paramount Alloys, a subsidiary of the A.P.V. Company, contains a considerable amount of information on the design and machining of castings. Aspects considered include design, composition and characteristics, pattern equipment, machining, welding, repair, corrosion resistance, polishing, and treatment for moving parts.

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An illustrated description of their Godley factory, where ice cream, meat pies, and sausages are produced, is the principal feature of the winter number of *Wall's Magazine*. Apart from personal news items, the magazine includes articles on the ice cream sales convention of 1950-51, the depot at Guildford, Surrey, and notes of interest from the various divisions and factories of the company.

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The wide range of equipment which they have available for the ice cream industry, from manufacturing to storage, is illustrated in the newly produced booklet *Ice Cream by Prestcold Refrigeration*. Also illustrated are various installations using Prestcold equipment.

The October 1950 issue of *Prestcold Times* features an account of the company's sales convention at Cowley, a distributors' dinner at the Trocadero, London, and the third annual service supervisors' conference. There is a description of the company's participation at the Royal Agricultural Show and news items from overseas, all copiously illustrated.

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In continuation of their policy of issuing practical instructions for the fabrication of high nickel alloys, Henry Wiggin and Company have published a comprehensive handbook dealing with the hot-working, annealing, and pickling of nickel, Monel, and Inconel.

The first section on hot-working deals with suitable fields, hot-working temperatures, methods of forging, and with dies and lubrication.

The second section covers methods suitable for annealing these high nickel materials, while the final section gives full details and formulae for pickling.

A self-service shop on wheels, one of the latest of the Austin Crompton Parkinson large type electric vehicles.

Festival Factory Visits

British manufacturers who are willing to receive visitors at their factories during the Festival of Britain, 1951, are invited to send particulars to the Council of Industrial Design. The Council will compile a list of such firms and arrange for it to be carried at all industrial information bureaux in the official Festival Exhibitions; it will be issued to visitors on presenting a trade or business card.

Manufacturers who would like their names to appear on the list should write to Mr. S. D. Cooke, Council of Industrial Design, Tilbury House, Petty France, London, S.W.1. (telephone Victoria 8484), enclosing in addition to the name and address of their factory some particulars of the goods they make, the approximate number of employees in the factory or other indication of size, the most convenient days and hours for receiving visitors, and the person to whom visitors should apply in advance. Details of languages spoken by staff available as conductors will be welcome.

Report of Foyle Trust

The amount distributed for educational grants was the highest in the history of the Trust, it is stated in the ninth annual report of the Charles Henry Foyle Trust for the year ended May 31, 1950.

The gross income for the year was £5,757, of which £5,565 was distributed in the form of grants, donations, etc. Almost 200 applications were dealt with during the year.

Visit to South Africa

Mr. J. Arthur Reavell, M.I.Mech.E., M.I.Chem.E., F.Inst.F., chairman of Kestner Evaporator and Engineering Company of London and Kestner (S.A.) (Pty.) of Johannesburg, recently left England on a visit to South Africa.

During his stay he is visiting a number of works where Kestner plants and processes are in the course of erection, and discussing new projects with leaders of the South African chemical, food, and allied industries.

The South African company is now manufacturing in the Union over 90 per cent. of their orders, only the specialised parts having to be shipped from England.

Sister for the "Fairfree"

A further quick-freezing factory ship is to be built by Chr. Salvesen and Co. of Leith. John Lewis and Sons of Aberdeen are to build the vessel, which will be a stern-operating trawler 240 ft. long, incorporating many of the ideas put into effect in the factory ship *Fairfree*. The machinery will be of the new Lewis-Doxford type, manufactured in Aberdeen by Lewis under licence from the Doxford organisation. Since her acquisition by Salvesen's, the *Fairfree* has been working in the Newfoundland waters and has landed heavy catches regularly at Glasgow. The advantage of the vessel lies in her ability to make long-distance trips, to process within an hour of catching, and to land packed high-grade fish at a Scottish port ready for distribution or for holding against a better market. Leading Scottish scientists have repeatedly advocated quick freezing at sea as offering the best prospect for revival of the industry, but to date the *Fairfree* has been the only commercial unit to tackle this work, and apparently to achieve financial stability, if the order of a further unit can be regarded as an indication.

COMPANY NEWS

By continually improving production methods and the quality of the products manufactured, and by maintaining strict economy measures, it had been possible to deal with the adverse trading conditions which had persisted for ten months of the financial period under review, reported the chairman, Mr. W. Garfield Weston, when he presided at the fifteenth annual general meeting of Allied Bakeries recently.

During the year the interests of the group were divided for administrative convenience into three sections, *viz.* Southern, Northern, and Scottish bakeries, with a fourth section for biscuit manufacturing companies; high executives and leading technical staff were redeployed to the best advantage, and the number of operating companies was reduced by amalgamations and absorptions—a process which was still continuing.

Interests in Australia and South Africa were showing satisfactory development.

Referring to the retention of the ordinary dividend at the level of 20 per cent., the chairman announced that in view of the lighter calls on the liquid resources of the company, the board would be able to reconsider its dividend policy with especial reference to the claims of the smaller shareholders.

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The year under review had not been a particularly easy one, reported Mr. Wm. P. Webster, chairman and managing director of Wright's Biscuits, when he presided at the fourteenth ordinary general meeting of the company.

Supplies of sugar and fats continued to be restricted and items such as wages, transport costs, and packing materials were becoming more expensive. During the year they had been able to procure unrationed ingredients from abroad which had enabled production to be increased, and sales during the year were the largest in the firm's history.

The share capital of George Lunt, Sons and Co., a bakery concern in the Liverpool area, had been acquired, and a further manufacturing unit had been brought into operation at South Shields.

A final dividend of 1s. 7½d. per share, less tax, making with the interim dividend already paid 2s. per share, less tax, on the ordinary and "A" ordinary shares, was approved.

OBITER DICTA

- The world is passing into an Oliver Twist phase of wanting more food and of having more mouths to feed.—*Mr. Maurice Webb, Minister of Food.*
- Why do fishing boats catch more when fish prices are high? —*Schoolboy at a United Nations conference in London of "Tomorrow's Citizens."*
- The shopkeeper who allows cats to sit on the counter is behaving badly, and if he tells you that he keeps cats to keep down mice in his shop he is behaving worse. — *Mr. Fred Willey, M.P.*
- Instead of training new officials, the Ministry ought to send these men into the country to produce eggs.—*Mr. A. Preston at a meeting of the National Farmers' Union.*
- The British Government's policy seems to be concerned with export only, and it does not seem to matter two hoots what is imported.—*Chairman Edward Wilson, of the Fruit Committee of the Ulster Farmers' Union.*
- There are some women with big appetites as well as men, and if we are all charged the same prices we are entitled to equal amounts.—*Miss Lilian Lenton, member of the Women's Freedom League.*
- The world was entering the "Food Age" and for the next 100 years food was going to be the most important factor in international relationships. — *Mr. J. O. Cherrington, the Hampshire Council delegate at the annual meeting of Rutland county and Stamford branch of the National Farmers' Union.*
- In the nuts (unground) (other than groundnuts) Order, the expression "nuts" shall have reference to such nuts, other than groundnuts, as would, but for this amending order, not qualify as nuts (unground) (other than groundnuts) by reason of their being nuts (unground).—*Extract from a Government Order.*
- They could start with a National Food Week, during which Mr. Webb would take the brake off all rationing. Those plates of tomato soup we all know so well would be prohibited in any public eating place. Sausages would stage a pre-war revival, and whale meat would be returned to the ocean.—*Lord Balfour of Inchrye at a recent meeting of the National Paint Federation.*

At a board meeting of L. Rose and Co. held recently, the directors declared a dividend on the preference shares of the company for the six months ending December 30, 1950, at the rate of 6 per cent. per annum, less income tax.

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A further expansion of the company's business, resulting in an increased trading profit, was reported by Sir Harry Jephcott, M.Sc., Ph.C., F.R.I.C., chairman and managing director, when he presided over the sixteenth annual general meeting of Glaxo Laboratories.

Particular attention has been given to increasing the efficiency of all manufacturing processes and in this respect they had benefited from participation in the Anglo-American productivity teams.

Overseas and export business continued to make good progress and total sales overseas had increased by more than 30 per cent. There was now a substantial dollar export business and a Canadian subsidiary company had recently been formed. Expenditures upon research and development were ten times greater than in 1939.

A final dividend of 12½ per cent., making 17½ per cent. for the year, was recommended.

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The directors of Maconochie Foods, which became a public company in January 1948, are unable to recommend payment of any dividend on either the preference or the ordinary shares at present.

Draft accounts for the year to August 31 show that the U.K. companies trade at a small loss; in addition, provision has been made for the estimated loss applicable to the group of approximately £25,000 which had been incurred by the South African subsidiary company during the twelve months to July 31. Measures to counteract the decline in trading profits will not become fully effective until early in 1951, but trading results are expected to show gradual improvement during the coming months.

▪

At a recent board meeting, the directors of Foster Clark decided to recommend to ordinary stockholders a final dividend of 17½ per cent., less tax, making a total dividend of 25 per cent., less tax, for the year ended September 18, 1950, the same as last year.

World Food News

Glycerin in Pectin Jelly

The growing usefulness of glycerin in pectin-containing preparations is shown in a method of making a new food product. According to G. L. Baker and M. Olliver (U.S. Pat. 2,524,416), this material is a concentrated pectin jelly composition in the form of a solid aqueous gel which will form a larger volume of an edible dessert jelly when dissolved in hot water and then cooled. The gel is composed of an aqueous partial dispersion of pectin, calcium pectate, a water solution of an edible salt of a polyvalent metal, and a sweetening agent of sugars or glycerin.

Frozen Food Packaging

Primarily for use in packaging frozen fruits, metal-end frozen food packages have been introduced by a St. Louis company. The bodies of the cans are paraffin treated inside and the metal ends are coated to give the maximum protection to the produce. The cans are labelled with covers supplied by the customers to the company's specifications.

The main advantage of these metal-end cases is the resistance to leakage which they offer. Additionally, all sizes enable the cans to be filled and closed at high production speeds. The use of the lithographed label, in as many colours as desired, gives an eye-catching value of importance in promoting sales. In some instances lithographed metal ends are used which further enhance the appearance.

Glass-packed Vegetables

Markets abroad for the new glass-packed vegetables of Batchelor and Co. (Ireland), produced under the name Crystal Pack, would be sought when the home demand had been satisfied, stated Mr. J. E. Lalor, chairman, at the annual meeting of the company in Dublin. Enquiries regarding the possibilities of export had already been received.

In view of the world situation, he said, it was advisable to encourage the development of this pack from a national standpoint. If there had been similar production facilities and experience at the Irish factory in the use of glass containers as an alternative to cans, problems of production in the critical years of the war might have been minimised.

Floating Fair Shelved

Owing to the international situation and Norwegian exporters' delivery difficulties, the project to send the liner *Peter Wessel* to Mediterranean ports to display Norwegian export goods has been shelved for the time being.

Norwegian Herring Oil Factory

A new Norwegian herring oil factory is to be built in Alesund a site for which has already been secured.

The share capital has been subscribed by private persons and fishermen's organisations, and the municipality is also expected to subscribe a considerable sum.

It is intended to keep the factory in production for more than the two or three months of the herring fishing season. New preserving methods for herring and herring products are to be tried out and the factory will also handle other raw materials.

Tribute to Irish Beet Growers

In a paper read to the Congress of the Irish Sugar Beet Growers' Association in Carlow recently, on behalf of Dr. Paul E. Miller, chief of the E.C.A. Mission to Ireland, tribute was paid to Ireland for her progress in developing the sugar industry.

The growers deserved much of the credit for the fact that in 25 years Ireland had been able to produce most of her sugar requirements, said Dr. Miller; production of sugar beet had increased from 5,000 acres in 1931 to more than 60,000 acres in 1950.

More increases appeared probable through the application of improved practices, and in a relatively short time Ireland would be producing her entire sugar needs.

Salt Production in S. Australia

Next to iron ore, salt is the most important mineral produced in the State of South Australia, which supplies 60 to 70 per cent. of Australia's total output of approximately 260,000 tons p.a. Average output over the past nine years was 170,000 tons, and expansion plans are expected to increase the yield to over 200,000 tons. By more intensive working of all areas, it is considered that the yearly output would be stepped up to more than 800,000 tons.

Triple-action Soapless Soap

New triple-action soapless soaps, which simultaneously remove dirt and unpleasant smells and destroy bacteria, have been developed in joint research conducted at three eastern colleges, it was disclosed at a recent American Chemical Society meeting.

Technically termed invert soaps, the new chemically stable synthetic detergents are said to be ten times as effective as any known deodorant.

The detergents' deodorising qualities suggest uses in the form of solutions or sprays in industries where unpleasant or even obnoxious odours are produced. In the germicidal field the new detergents can be used instead of any of the present commercial types, not only in solution but also as solid powders or pellets.

Whaling Season Opens

The 1950-1 whaling season in the Antarctic opened on December 22, 1950. Nineteen pelagic expeditions and 3 shore stations are engaged in the hunt for the 16,000 "blue whale units," which is the maximum catch permitted by international agreement. The 19 factory ships and 3 shore stations are supported by 202 catcher-boats; the number of shore stations is the same as last season, but there is one more pelagic expedition, the factory ship *Olympic Challenger*, financed by the U.S.A.

The total output of whale oil should be a little over 2 million barrels or about 340,000 tons; much of the Norwegian output has been sold in advance, including 30,000 tons to Britain at a price of £100 a ton and some to Continental buyers more recently at £110 a ton.

The new expedition which is taking part this season is not expected to increase the total amount of oil produced, as the total quota of whales which may be caught remains the same; total oil production may in fact drop as more of the quota will be caught early in the season when the oil content of the whales is not at its maximum.

Australian Meat Packing Plant

The establishment of a deep-freezing and packing plant in the Northern Territory at an estimated cost of £2 million is planned by Eastern Development Proprietary of Sydney.

OVERSEAS ENQUIRIES

Dried Fruit Machinery

The United Kingdom Trade Commissioner at Sydney has advised that E. Mallison and Co., 18-15, O'Connell Street, Sydney, desire to contact United Kingdom manufacturers of a dried fruit washing and drying machine suitable for sultanas, raisins, or currants.

The machine must be capable of washing and drying 5-12 tons per hour and practically all the moisture must be removed within a few seconds without the application of excessive heat.

Interested United Kingdom manufacturers are invited to send full details, including prices, delivery, and any available literature of the plant they have to offer, direct to the company.

*

Herring in Tomato Sauce

The United Kingdom Trade Commissioner in Malaya, at Singapore, has reported that Maclaine Watson and Co. (Malaya), Ltd., Union Building, Singapore, wish to receive quotations for herring in tomato sauce, packed in oval 14 oz. cans, each containing 6 to 7 fish, from United Kingdom packers not already represented in Malaya.

Firms interested in this enquiry are requested to forward their quotations direct to the London office of the company at 14, Fenchurch Street, London, E.C.3.

*

Starch-making Plant

The United Kingdom Trade Commissioner at Lahore reports that he has received an enquiry from Mr. Khurshid Hassan Kazi, of Pakistan Refrigeration, Post Box 17, Peshawar, regarding plant for the production of starch from maize. This company is understood to be closely connected with the scheme envisaged by the Chief Secretary, Swat State, who recently expressed interest in such plant; but as the directors of that project have not yet been decided upon, Mr. Kazi wishes in the meantime to obtain information about suitable machinery himself.

The plant he visualises would produce 15 tons of starch per day, although he would be prepared to modify this figure if it were found in the light of expert advice to be uneconomical. Mr. Kazi adds that the suppliers of the plant would be required to undertake erection and to supply an engineer to run it for a period after it comes into operation.

Interested United Kingdom firms who have sent (or propose to send) details of their products to the Chief Secretary, Swat State, are invited to communicate with Mr. Kazi on similar lines.

*

Sugar Cane Grinding Mill

H.M. Consul at Arequipa, Peru, reports that Señor Ernesto Barten, Casilla 447, Arequipa, is interested in the purchase of a sugar cane grinding mill equipped with five rollers (two for breaking the knots and three for crushing) and capable of grinding 30 to 40 tons of cane per 8 hours. The cane to be ground is red and hard, of the P.O.J. variety. It is understood that Sr. Barten has already acquired a turbine engine for the mill he wishes to buy.

Interested United Kingdom firms are invited to send literature on their products, together with prices and delivery particulars, direct to Sr. Barten at the above address.

*

Fine Foods Specialities

The United Kingdom Trade Commissioner at Vancouver, B.C., has reported that the Robert Forbes Co., 207, West Hastings Street, Vancouver, B.C., are desirous of representing United Kingdom manufacturers of fruit juices, confectionery, canned meat, and fine food specialities.

Firms interested in this enquiry should forward quotations c.i.f. Canada direct to the company.

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Foodstuffs and Beverages

The British Consul-General at New York has reported that R. C. Williams and Co., Inc., of 257-273, Tenth Avenue, New York, 1, are desirous of contacting United Kingdom manufacturers of confectionery, canned fish, canned and bottled fruits, preserves, and vegetables, sauces, and non-alcoholic beverages.

Firms interested in this enquiry should forward quotations c.i.f. in dollars direct to the company.

*

Smoked Fish

The British Consulate-General at San Francisco has reported that the Atlantic Fish Company, 201-203, Davis Street, San Francisco, is desirous of receiving quotations for smoked finnan haddie, boneless and skinless.

Firms interested in this enquiry should forward quotations in U.S.A. dollars, c.i.f. San Francisco, direct to the Atlantic Fish Company.

Confectionery and Biscuits

The United Kingdom Trade Commissioner for the Maritime Provinces and Newfoundland at Montreal has reported that the firm of W. A. MacLeod, 26, Morrison Street, Sydney, Nova Scotia, are desirous of handling the distribution of United Kingdom confectionery and biscuits in Nova Scotia and in particular in Cape Breton Island.

Firms interested in securing their services for this area should forward full particulars direct to the company.

*

Bakery Equipment

The Commercial Secretariat of the British Legation at Beirut has advised that the firm of Badre Dimechkie, 106, Rue Bliss, Beirut, are considering the establishment of a modern bakery. No details as to its capacity are available.

Certain United Kingdom manufacturers may already have been approached direct but it is suggested that other United Kingdom manufacturers should forward full details of the ovens and ancillary equipment they have to offer direct to Badre Dimechkie at the above-mentioned address. Where possible prices should be quoted for representative items.

Plastic Package for Vegetables

Garden-fresh vegetables can be kept longer and shipped farther than ever before through the use of a new plastic package, which holds in moisture but lets the vegetables "breathe," it was announced by H. F. Robertson of the Union Carbide and Carbon Corporation, New York, at a recent meeting of the American Chemical Society.

The new packaging is made of polyethylene film which transmits oxygen from five to 20 times more readily and carbon dioxide up to five hundred times more readily than other plastic films tested, it is claimed. The same material is said to hold water vapour four to six times better than other plastics.

Actual shelf-life tests, using a standard brand of lettuce, were run to confirm the value of the new packaging plastic. The unpackaged lettuce had an average shelf-life of two days; other packaging materials extended this life to 7·3 to 7·8 days. Ten samples of the lettuce were tested in polyethylene packages and showed an average shelf-life of ten days, a 30 per cent. increase.

Roderick K. Eskew accepts the U.S. Department of Agriculture's Distinguished Service Award from Knox T. Hutchinson, Assistant Secretary of Agriculture, on behalf of the volatile flavour concentrate research team.

Recovering Fruit Flavours

The Eastern Regional Research Laboratory's research team, which developed the first successful process for recovering the volatile flavours of fruit juices in concentrated form, was recently honoured by the Department of Agriculture at a special ceremony at the Laboratory.

The team—Roderick K. Eskew, G. W. M. Phillips, R. Henry Morris, 3rd, Edward L. Griffin, Jr., Richard P. Homiller, Nelson H. Eisenhardt, and Howard Milleville—received the Department's Distinguished Service Award from Knox T. Hutchinson, Assistant Secretary of Agriculture. On behalf of the group, Mr. Eskew, head of the Chemical Engineering and Development Division, accepted the award, which is the highest granted by the Department for outstanding public service.

In the new process, the volatile substances that give the fruit its characteristic flavour and aroma are obtained by rapidly vapourising from 10 to 25 per cent. of the juice. The volatile flavours set free are then concentrated to a product with an aroma about 100 times stronger than the original juice. The product, called "essence" by the team, is used in beverages, confectionery, and ices, and to restore natural fruit flavours to jellies, jams, and frozen concentrated juices. Addition of water to a frozen concentrated juice containing essence gives a drink that is practically indistinguishable from fresh fruit juice.

The Eastern Laboratory is studying the utilisation of apples and other eastern fruits, vegetables, animal fats, and oils; milk by-products, tobacco, white potatoes, hides and skins, maple products, and honey.

Pressure Packing of Coffee

Coffee packed under pressure instead of in a vacuum is now being offered for sale by Standard Brands, Inc., of New York. Pressure packaging, which is being used for all grinds of coffee, makes it possible to seal the product in the can while it is still hot from the roaster. This is claimed to eliminate a loss in flavour which occurs during the cooling-off period necessary in vacuum packing.

It is expected that the old-type containers will be entirely replaced in the near future by this company.

Irish Sugar Beet Crop

The sugar beet crop in the Republic of Ireland, which promised to be a record one when tests of yield and sugar content were made in August, will reach about the same level as last year, when 625,000 tons of beet were sent to the factories.

Although the early-sown crops have shown satisfactory results, the growth of the late-sown crops has been retarded because of the cold, wet weather.

Last year about 88,000 tons of sugar were manufactured at the four Irish factories. This is about equal to the domestic demand, but most of the sugar is used in the manufacture of sweets, chocolate crumb, and other goods for export.

The Irish sugar manufacturing season began on October 17, when the first of the crop reached the factories.

According to preliminary figures issued by the Central Statistics Office in the Republic, the acreage under sugar beet at June 1, 1950, was estimated at 60,300, against 59,500 at the corresponding date in 1949. This represents an increase of 1·3 per cent.

Cocoa from Trust Islands?

The Trust Islands of the Pacific have been suggested as a possible new source of chocolate and cocoa to the U.S. Defence and Interior Departments.

Mr. R. Burton, of Santa Cruz, California, reporting on 20 months' work at the U.S. Agricultural Demonstration Station on Ponape Island, in the Eastern Carolines, said experimental plantings of cocoa had done remarkably well, yielding over 600 lb. of dried beans per acre.

The good quality of the beans, the apparent freedom from disease, and the wholesale value of over $90 an acre—as against an average return of $40 for copra—indicate that cocoa planting in Ponape, Kusaie, and possibly Truk might well be considered.

Value of Nonfat Milk Bread

Bakers using nonfat milk solids in bread are placed in a high quality category by scientists who have tested various types of bread by animal feeding methods. Doctors Riggs, Beaty, and Johnson of the National Dairy Products Co., New York, have shown that the addition of 6 per cent. nonfat dry milk solids improves the nutritional value of water bread, enriched water bread, and whole wheat bread.

Their work, published in the *Journal of Dairy Science*, verifies work of University of Illinois scientists Mitchell, Hamilton, and Shields, that nonfat milk solids definitely improve the nutritive value of enriched white bread and whole wheat bread. Both groups of investigators used white rats as test animals and measured gain in weight in addition to skeleton changes to determine proper growth.

Using a newer, more critical method, Dr. A. Beaty of National Dairy Products Co., and Dr. B. W. Fairbanks of the American Dry Milk Institute designed experiments in which female white rats were fed different breads through three gestation-lactation periods. The third litter showed startling differences.

These three studies emphasise the value of milk solids in bakers' bread and a recent trend in the baking industry has been to feature the nonfat milk content of bread because of its recognised nutritional value and palatability. Bread made with 6 per cent. nonfat milk solids contains the same nonfat milk content as bread made using milk or separated milk as the only liquid.

News from the Ministries

Export Licensing Regulations

The existing export licensing regulations are contained in a one-year-old Consolidation Order and eight subsequent amendments.

These have now all been embodied in a new Consolidation Order, giving full details of all goods subject to export licensing. This Order, entitled the Export of Goods (Control) (Consolidation) Order, 1950 (S.I. 1950, No. 2188), came into operation on January 8; it makes no further change in the existing regulations.

Unrestricted Soft Currency Imports

Individual licences are no longer required for the import, from the usual "liberalisation" list of countries, of canned grapes, apples, fish or animal gelatin, glue, and osseine.

This unrestricted import is permitted from all countries other than Albania, Argentina, Bolivia, Bulgaria, Canada, Colombia, Costa Rica, Cuba, Czechoslovakia, Dominican Republic, Ecuador, El Salvador, French Somaliland, Germany (Russian Zone), Guatemala, Haiti, Honduras, Hungary, Iran, Japan, Korea, Liberia, Mexico, Nicaragua, Panama, Philippines, Poland, Roumania, Tangier, United States of America, Union of Soviet Socialist Republics, Venezuela, and Yugoslavia.

Export Trade Concession

In order to assist manufacturers and traders engaged in the United Kingdom export trades, it has been arranged, as an experimental measure, that samples of foreign-made goods required for the furtherance of exports from the United Kingdom may, in certain circumstances, be imported without payment of Customs duty or purchase tax.

The Customs control over such importations will be maintained but procedure has been simplified in order to hasten clearance.

The scope of the concession and the steps to be taken by an importer in order to qualify for remission of Customs duty and purchase tax are set out in Customs Notice No. 118, copies of which can be obtained from any Customs Office.

Manufacture of Feedingstuffs

The Feedingstuffs (Manufacture) Order, 1950, which came into force on December 17, 1950, and replaces the Feedingstuffs (Manufacture) Order, 1949, as amended, has been made. The principal effects of the new Order are as follows:

1. Feeding dried blood has been included in the definition of an animal protein rich substance.
2. The manufacture of mixtures for certain types of birds has been freed from control.
3. Formulae for National Cattle Food No. 4 and National Poultry Food No. 3 (*a*), which may now be manufactured by any licensed compounder, have been included in the Second Schedule to the Order.
4. The percentages of ingredients contained in some compounds have been amended and additions have been made to the lists of compounds in which certain ingredients may be used.
5. The method of expressing calcium in the analysis of National compounds and the reference to substitutes for cod liver oil have been amended.

Imported Canned Fruit

The Imported Canned Fruit Order, 1950, has been amended with effect from January 1, 1951, so as to make the following changes:

1. Canned grapes are freed from price control.
2. Maximum prices are prescribed at all stages of distribution for imported canned pineapple (including crushed pineapple) packed in large sized cans containing 100 oz. or more.

As already announced by the Board of Trade on December 21, 1950, canned grapes may now be imported on open general licence from any country except those specified.

The prices prescribed by the amending Order for cans of pineapple (including crushed pineapple) containing 100 oz. or more are as follows:

On a Sale to a Wholesaler	*On a Sale by Wholesale*
(*Rate Per Dozen Cans*)	
s. d.	s. d.
86 1	91 7

Token Imports

SCHEME TO CONTINUE IN 1951

The Token Import Scheme is to be continued in 1951 for the same countries and the same commodities as in 1950.

The Token Import annual quota will, however, be increased from 20 per cent. to 40 per cent. by value of each manufacturer's average annual trade in 1936-1938 with the United Kingdom in the commodity in question.

In addition, it has been decided that in cases where a manufacturer in one country has ceased to make a commodity for which he is, or was, entitled to a quota under the Scheme, his quota may be allocated to other manufacturers of that commodity in that country, whether or not they have been qualified to participate in the Scheme hitherto.

The countries participating are: Australia, Belgium and Luxembourg, Canada, Denmark, Finland, France, Holland, India, Italy, Norway, Pakistan, Sweden, Switzerland, and U.S.A.

Applications from importers in the United Kingdom for import licences under this Scheme can be given consideration only when accompanied by the relative documents obtained by their suppliers from the appropriate overseas authority. A description of the document required and the names of the respective issuing authorities are listed in Notice to Importers No. 418 obtainable from the Import Licensing Branch, Board of Trade, Romney House, Tufton Street, London, S.W.1.

A consolidated list of commodities which may be imported under the Scheme has also been prepared by the Import Licensing Branch; most commodities on this list, if imported from Australia, Belgium and Luxembourg, Denmark, Finland, France, Holland, India, Italy, Norway, Pakistan, Sweden, and Switzerland, may be imported without separate licence, and without the need to produce token import scrip. Notice to Importers No. 401 contains a list of commodities on open general licence as at September 21, 1950. This list has been amended and will be further extended from time to time.

Imports of Meat Products

THE NECESSITY FOR OFFICIAL CERTIFICATES

The attention of all importers of meat products, including canned meat products and animal casings, has been drawn by the Ministry of Food to the provisions of the Public Health (Imported Food) Regulations, 1937/48, for England and Wales, under which it is illegal to import any meat or meat products for sale for human consumption unless accompanied by an official certificate.

An official certificate may be either a certificate, label, mark, stamp, or other voucher which is recognised by the Minister of Food as showing:

(*a*) that the meat, including any meat used in the preparation of a meat product, was derived from animals which had been inspected *ante mortem* and *post mortem* and passed as fit for human consumption in accordance with criteria satisfactory to the Minister, and

(*b*) that the meat and meat products had been prepared and packed under hygienic conditions.

None other than an official certificate can be accepted.

There are corresponding Regulations in force in Scotland and in Northern Ireland.

The duty of executing and enforcing the provisions of the Regulations is laid upon Port Health Authorities and certain local authorities which are empowered to order the exportation of any meat or meat product not accompanied by an official certificate.

It is in the interests of all concerned that, before entering into negotiations with overseas firms, they should ascertain whether imports are permitted under the import licensing regulations and, if so, whether an official certificate is recognised for imports of meat products from the exporting country, and to make certain that the exporters are fully aware of the form of certificate which must be affixed to the goods before shipment.

Copies of the regulations and of the Ministry of Health and Ministry of Food circulars which reproduce the official certificates at present recognised may be obtained from H.M.S.O. or through any bookseller. Information regarding official certificates may be obtained from the Ministry of Food, Food Hygiene Division, 4, Clarence Terrace, Regent's Park, London, N.W.1.

Wheat, Oats, and Dredge Corn

The Wheat (Great Britain and Northern Ireland) (Amendment No. 2) Order, 1950, the Oats (Great Britain and Northern Ireland) (Amendment) Order, 1950, and the Dredge Corn (Great Britain and Northern Ireland) (Amendment No. 3) Order, 1950, came into operation on January 1, 1951.

These Orders prescribe fixed and maximum prices for wheat, minimum and maximum prices for oats, and maximum prices for millable dredge corn in Great Britain and Northern Ireland for January to June, 1951.

Overseas Food Corporation

At Lord Rothschild's request, the Minister of Food has agreed to release him from his appointment as a part-time member of the board of the Overseas Food Corporation. This will enable him to devote more time to his responsibilities to Cambridge University and the Agricultural Research Council, though he will continue to advise the Corporation on scientific questions.

Prices of Eggs

The Eggs (Great Britain and Northern Ireland) (Amendment No. 9) Order, 1950, which prescribes prices for eggs sold by producers, licensed buyers, and wholesalers on and after December 10, 1950, has been made.

The Government's intentions about the prices to be paid to producers for first quality hen and duck eggs sold to licensed buyers, licensed collectors, and licensed packers from December 10, 1950, were set out in the joint announcement issued by the Ministry of Food and the Agricultural Departments on September 20 last. The prices to which the new Order gives effect are as follows:

	Hen Eggs Per Dozen.	*Duck Eggs Per Dozen.*
	s. d.	*s. d.*
From Dec. 21, 1950, to Feb. 28, 1951	4 6	4 2
On and after Mar. 1, 1951 ...	3 6	3 2

The rates of deduction for dirty and second quality eggs are unchanged. Appropriate amendments have been made to the specified rates of deduction in Northern Ireland for eggs unfit for human consumption.

The new Order prescribes maximum prices only for eggs sold by licensed buyers (licensed collectors in Northern Ireland) to licensed packers. Previously minimum and maximum prices were prescribed for such sales in Great Britain and fixed prices in Northern Ireland.

The new maximum prices for first quality eggs are as follows:

	Hen Eggs Per 120	*Duck Eggs Per 120*
	s. d.	*s. d.*
From Dec. 21, 1950, to Feb. 28, 1951	45 10	42 6
On and after Mar. 1, 1951 ...	35 10	32 6

Effect is also given to the Minister's earlier decision to increase the margins allowed to retailers of eggs by reducing by 2d. per 120 eggs the maximum prices of all categories of eggs sold by wholesalers and secondary wholesalers to retailers.

Commonwealth Sugar Agreement

Agreement has been reached on the price to be paid by the United Kingdom for sugar imported from Commonwealth producers in 1951 under the Commonwealth Sugar Agreement. The price will be increased from £30 10s. per ton to £32 17s. 6d. per ton f.o.b.

Export Licensing Charges

In accordance with a Board of Trade Order, the Export of Goods (Control) (Amendment No. 8) Order, 1950, licences are now required for the export of certain plastic materials, some additional metals and alloys, and specified drugs and chemicals.

The Order also provides that licences are no longer required for (*inter alia*) the export of raw cocoa, cocoa husks, shells, and residues, some items of processed foods, bags and sacks of vegetable fibre (other than jute), and various drugs.

Danish Bacon Negotiations

Negotiations in London between representatives of the Danish Bacon Board and the Ministry of Food, on the price to be paid for bacon shipped from Denmark to Great Britain, have now been completed.

A price of 229s. per cwt. f.o.b. has been agreed for Danish bacon shipped from January 1 to September 30, 1951. This represents an increase of 5½ per cent. on last year's price.

Information and Advice

Table Jellies

B.4826. *We would be obliged to receive a recipe for the manufacture of jelly crystals.* (Ireland.)

The following is a typical formula for jelly crystals:

28 lb. fine castor sugar
5½ lb. powdered gelatin
½ lb. citric acid (powder)
4 oz. essences

The essences and colour (the latter dissolved in the minimum quantity of water) are rubbed into the sugar and the whole is passed through a coarse sieve. The gelatin and sugar are added and the whole is then mixed again and passed through the sieve once more to break up all lumps. The mixing should yield 136 pint packets at 4 oz. to the pint.

Mincemeat Manufacture

B.4869. *Please supply a recipe for the manufacture of mincemeat.* (Ireland.)

The following formula for mincemeat may be used as a basis for trial:

Apples (cored and peeled) ...	480 lb.	Sultanas ...	40 lb.
Syrup	20 gal.	Currants ...	160 ,,
Salt	6 lb.	Muscatels ...	40 ,,
Cinnamon ...	¾ ,,	Suet ...	25 ,,
Ground cloves ...	½ ,,	Citron ...	20 ,,
Ground nutmegs	¼ ,,	Orange peel	10 ,,
Spirits	2 gal.	Lemon peel	5 ,,

Sound, tart apples should be used, and chopped fairly fine. If the apples are sweet, enough tartaric acid should be added to make them snappy. The raisins and currants should be washed and cleaned. The orange and lemon peel are finely chopped, and the citron coarsely chopped. The suet should be chopped finely and put through a coarse sieve.

It will be necessary to test this to see that it conforms with the regulations set out in The Food Standard (Preserves) Order, 1944 (S.R. and O. 1944, Nos. 841 and 842), according to which the total soluble solids content must be not less than 65 per cent.

It is impossible to tell the exact total soluble solids content in the recipe given because the different ingredients vary in moisture content. Should the total solids not adhere to the requisite figures given in the Order, the quantity of apples could be reduced.

Information Supplied

The Enquiry Service has dealt with requests for the names of manufacturers and suppliers of plant, machinery, and materials, and also general information as follows:

B.4750. *Coffee essence.* (London.)
B.4751. *Flavouring essences.* (Lancs.)
B.4753. *Stoving lacquers for aluminium.* (Italy.)
B.4754. *Antibiotics as preservatives.* (Kent.)
B.4755. *Ice cream powder.* (Australia.)
B.4756. *Potato crisps.* (Ceylon.)
B.4757. *Tomato juice.* (Ireland.)
B.4758. *Buttermaking.* (Bombay.)
B.4761. *Lorry loading equipment.* (Scotland.)
B.4763. *Cheese flavouring.* (Sussex.)
B.4764. *Saccharified soya flour.* (Bucks.)
B.4765. *Lemon curd and piping jellies.* (London.)
B.4766. *Detachable van signs.* (Lincs.)
B.4771. *Non-brewed vinegar.* (Holland.)
B.4772. *Sultana cleaning plant.* (Sweden.)
B.4774. *Machine for wrapping meat pies.* (Herts.)
B.4775. *Potted meats.* (Bucks.)
B.4776. *Sausage filling machines.* (London.)
B.4779. *Training in food technology.* (Nigeria.)
B.4780. *Labelling of fish pastes.* (New Zealand.)
B.4781. *Canning of ham.* (Ireland.)
B.4782. *Opal jars.* (Leics.)
B.4783. *Sausage making machinery.* (London.)
B.4784. *Cream filling for biscuits.* (London.)
B.4786. *Fruit pulp prices.* (Lancs.)
B.4788. *Smokeless smoking kiln.* (Sussex.)
B.4789. *Identity discs for retort baskets.* (Lancs.)
B.4790. *Decorticating process for nuts.* (London.)
B.4801. *Breadmaking machinery.* (Nigeria.)
B.4802. *Rotary food slicer.* (London.)
B.4803. *Hydrol.* (Lancs.)
B.4805. *Vegetable cleaning machines.* (Cambs.)
B.4806. *Extruding machinery for paste foods.* (Notts.)
B.4807. *Peel curing.* (New Zealand.)
B.4808. *Potato crisps.* (Bombay.)
B.4809. *Pulping machine for lemons and oranges.* (Herts.)
B.4814. *Container for whipped cream.* (New Zealand.)
B.4816. *Synthetic cream.* (London.)
B.4817. *Blanching of almonds.* (Yorks.)
B.4818. *Manufacture of margarine.* (Berks.)
B.4821. *Egg lecithin.* (Ireland.)
B.4824. *Glacé cherries.* (Lincs.)
B.4825. *Deodorisation by ultra-violet rays.* (Ireland.)
B.4827. *Kola extract.* (London.)
B.4828. *Dried egg.* (Berks.)
B.4830. *Filling machine for cream.* (Lancs.)
B.4831. *Pickle injector pumps.* (Ches.)
B.4840. *Small chocolate enrobers.* (Suffolk.)
B.4841. *Synthetic cream.* (Yorks.)
B.4842. *Hydrol.* (Essex.)
B.4843. *Polythene wrapping material.* (Berks.)
B.4845. *Emulsions and synthetic creams.* (Worcs.)
B.4846. *Citrus oil.* (Lancs.)
B.4847. *Grape juice.* (Warwicks.)
B.4849. *Makers of collapsible tubes and tube-filling machines.* (New Zealand.)
B.4850. *Coding liner bags by perforation.* (Lancs.)
B.4853. *Almond grading, blanching, and drying machinery.* (Scotland.)

Information Required

B.4902. *Details of the manufacture of "gari" from cassava roots.* (Southern Rhodesia.)

Recent Patents

647,061. AASTED, K. C. S.: Method and apparatus for the manufacture of chocolate.
647,071. NOVOTNY, T.: Stripping grain of its husks.
647,085. WARD, H. H.: Treatment of oats and groats from oats.
647,090. NAAMLOOZE VENNOOTSCHAP HANDELSVEREENIGING VOORHEEN FIRMA E. RUYS: Roasted cheese products and process for making the same.
647,135. SHORT MILLING CO., J. R.: Process of preparing enzyme-peroxidised peanut oil.
647,140. FISCHER AND PORTER CO.: Apparatus for determining the viscosity of fluids.
647,150. GUYER, J. BUCHER-: Apparatus for elevating and washing fruit, beet, potatoes, and the like.
647,154. MID-WEST BOTTLE CAP CO.: Bottle caps.
647,200. AKTIEBOLAGET SVENSKA KULLAGERFABRIKEN: Method of making wrapping material and wrapping material produced thereby.
647,225. FOSTER, M. H.: Preserving jars and other similar vessels.
647,229. REST, J. N. VAN, and CHOVIL, W. A.: Closures for containers.
647,253. DAVID, V. M.: Dehydration of foodstuffs.
647,264. NAUGLE, J. J.: Treatment of sugar-containing solutions.
647,280. TAMINI, M.: Containers or the like.
647,590. PARK, INC., P. R., and VAN CAMP SEA FOOD CO., INC.: Process for treating fish press liquor and products resulting therefrom.
647,593. BRITISH CELLOPHANE, LTD.: Heat-sealable, moistureproof, transparent, wrapping material, and the process for the production of such material.
647,601. BRITISH THOMSON-HOUSTON CO., LTD.: Refrigerating systems.
647,611. MID-WEST BOTTLE CAP CO.: Bottle closure.
647,668. TILLY, J. O.: Envelope and package opener.
647,829. PATON, CALVERT, AND CO., LTD., and MELSHER, F. G.: Cartons.

Abstract of a Recent Specification

Casting Chamber for Chocolate

Machines for the casting of chocolate are generally provided with a casting chamber containing a number of measuring chambers and a body co-operating with such chambers, which body alternately connects each chamber with an inlet passage and with a casting nozzle. When the chambers are connected with the inlet passage chocolate will be sucked into them by a piston placed in each chamber, and when the chambers are connected with the casting nozzle the pistons will force the chocolate out again.

When the machine was to be converted to the casting of certain forms of chocolate, the entire casting chamber was previously made exchangeable, so that an entirely different casting chamber could be inserted whenever the moulds of the machine were changed.

As a casting chamber with its movable parts is rather costly and takes up relatively much space and, further, its replacement is rather cumbersome, attempts are usually made to avoid the use of several casting chambers and the manufacturers resort to closing some of the measuring chambers, for instance by uncoupling and fastening the pistons of such chambers in their innermost position. This expedient is, however, unsatisfactory because by such blocking of chambers the capacity of the machine is reduced correspondingly.

The object of the present invention is to make possible a conversion of the machine so that, on the one hand the same facilities exist for a casting suitable for each individual set of moulds, while on the other hand the replacement of the casting chamber, whenever moulds are exchanged, will be obviated.

For this purpose that part of the casting chamber which contains the measuring chambers is made up of one or more separate and independent piston blocks exchangeably mounted in the casting chamber proper. When other moulds are to be used it will then be necessary to remove only the block or blocks containing the measuring chambers concerned and replace them by blocks suitable for the new moulds and having chambers of a different cross-section for the individual casting nozzles.

While, for instance, one chamber may have a cross-section twice that of the chamber it replaces, the neighbouring chamber may be left out entirely, if the new set of moulds placed in the machine require the use of, say, only every other nozzle.

Each block may be provided with an external flange by which it may be fastened to the fixed part of the casting chamber by means of bolts or other fastening media. Thereby an especially simple exchange and fastening of blocks will be obtained.

As the exchange of blocks will not require an exchange of moving parts other than the pistons of the measuring chambers which are exchanged together with the chambers, it will be necessary to release only the link rods connecting the pistons with the moving parts of the measuring mechanism.
644,536. *Mikrovaerk, A/S.*

Recent patents have been selected from the "Official Journal of Patents" and are published by permission of the Controller of H.M.S.O.

Trade Marks

BARRY'S.—679,285. Chocolates and sweetmeats. **C. Barry and Company, Limited,** 156, Minories, London, E.C.3; Manufacturers.
MELIOR.—680,058. Flavourings (essential oils). **A. Saalfeld and Company, Limited,** Shield Works, Royds Street; Stockport Road, Manchester, 13; Manufacturers.
BAK-EO.—680,286. Pastry, cake, and scone mixtures. **Swift Australian Company (Pty.), Limited** (a Company incorporated under the laws of the State of Queensland, Commonwealth of Australia), 245-267, Stanley Street, South Brisbane, State of Queensland, Commonwealth of Australia; Manufacturers.
BEEHIVE.—688,155. Plain flour, self-raising flour, pearl barley, rice, tapioca, and oatmeal. **F. and E. Butterworth, Limited,** 16, Brunswick Street, Newcastle, Staffordshire; Wholesale Grocers and Provision Merchants.

Trade marks have been selected from the "Official Trade Marks Journal" and are published by permission of the Controller of H.M.S.O.

New Companies

Norfolk and Albion (Wholesale), Limited. (486699.) 19, High Street, Slough, Bucks. To carry on business of wholesalers of excisable liquors, wholesale fruiterers and greengrocers, bacon factors and merchants, etc. Nom. cap.: £1,000 in £1 shares. Dirs.: S. Jones, 122, Windsor Lane, Burnham, Bucks; J. D. Jones, The Priory, Burnham, Bucks; R. Giordano, Norfolk Hotel, Bournemouth.

Casswell, Wood, and Company, Limited. (486720.) Quadring Road, Gosberton, near Spalding, Lincs. To carry on business of produce merchants and dealers in agricultural and garden produce, etc. Nom. cap.: £6,000 in £1 shares. R. D. Wood, 42, King Street, Knutsford, Cheshire, signs as director.

R. C. Deacon, Limited. (486762.) The Retreat, Little Houghton, Northampton. To carry on business of growers, importers, and exporters of and dealers in fruit, flowers, potatoes, vegetables, etc. Nom. cap.: £500 in £1 shares. Permt. dirs.: R. C. Deacon (ch.) and Mrs. M. A. Deacon, The Retreat, Little Houghton, Northampton.

Austin, Walker and Austin, Limited. (486838.) 118, Park Road, North Acton, W.3. To carry on business of manufacturers of and dealers in chocolate and confectionery, food products, ice cream, etc. Nom. cap.: £1,000 in £1 shares. Dirs.: C. W. Austin and E. K. B. Austin, 38, Gloucester Road, Teddington; A. T. Walker and W. W. C. Walker.

Marsden's Pure Food Products, Limited. (487041.) 10, High Street, Newport, Mon. To take over the business of bakers and manufacturers of cooked foods carried on as Marsden's Table Delicacies, at Oak Street Bakeries, Oak Street, Newport. Nom. cap.: £500 in £1 shares. Permt. dirs.: R. J. Thomas, Daltrie, Carlton Road, Newport; H. M. Thomas, 44, Fields Road, Newport.

Davidson Packaging Company, Limited. (488359.) 62, Granville Street, Birmingham, 1. Nom. cap.: £1,000 in £1 shares. Dirs.: A. D. Davidson and Mrs. D. Davidson, 27, Green Road, Hall Green, Birmingham, 28.

Home Produce Distributors (London), Limited. (488418.) 33, King Street, Covent Garden, W.C.2. To carry on business of dealers in, importers and exporters of fruit, vegetables, nuts, and foodstuffs of all kinds, etc. Nom. cap.: £2,000 in £1 shares. Dirs.: G. A. E. Payne, 58, Tollington Way, N.7; E. L. Jones, 151, Portsmouth Road, Lee-on-Solent, Hants.

Howes (Brixton), Limited. (488419.) 62, Atlantic Road, Brixton, S.W.9. To carry on business of dealers in confectionery, chocolates, sweets, etc. Nom. cap.: £3,000 in £1 shares. Dirs.: R. A. Howe and Annie E. E. Howe, 62, Atlantic Road, S.W.9.

Cantrell and Cochrane (Fruit Products), Limited. (488616.) To take over business carried on at Gloucester, and elsewhere, as Archer's Apple Juice, to enter into an agreement with Seager, Evans and Company, Limited, and Cantrell and Cochrane, Limited, to manufacture and sell any fruit juices, essences, or extracts, etc. Nom. cap.: £100 in £1 shares. Dirs.: to be appointed by subs. Subs.: F. R. Furber and B. C. G. Elliott (solicitors), 18, Austin Friars, E.C.2.

Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C.2.